United States Court of Appeals

for the Second Circuit

APPENDIX

75-7362

United States Court of Appeals
FOR THE SECOND CIRCUIT

B

Docket No. 75-7362

PERMA RESEARCH & DEVELOPMENT COMPANY,

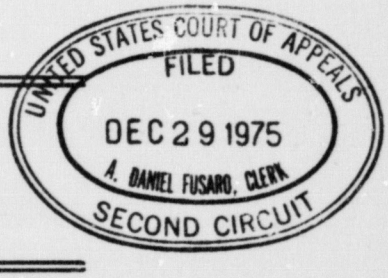
Plaintiff-Appellee,

—v.—

THE SINGER COMPANY,

Defendant-Appellant.

ON APPEAL FROM THE UNITED STATES DISTRICT COURT
FOR THE SOUTHERN DISTRICT OF NEW YORK



JOINT APPENDIX

VOLUME IV (Pages A-1087 through A-1506)
PORTIONS OF TRIAL TRANSCRIPT (pp. 5424-8090)

POLETTI FREIDIN PRASHKER
FELDMAN & GARTNER
Attorneys for Plaintiff-Appellee
777 Third Avenue
New York, New York 10017

WINTHROP, STIMSON, PUTNAM
& ROBERTS
Attorneys for Defendant-Appellant
40 Wall Street
New York, New York 10005

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All Exhibits are located in a Separate Exhibit Binder.

brought the over-sized cylinder to his attention?

A I don't know exactly when he said this, but he did say that around that period of time. Whether it was before or after, I couldn't really say right now.

Q And whenever he said it, you took it as the Gospel?

MR. BENBOW: Objection.

THE COURT: You don't have to answer it.

Q I want to ask you some questions about the gear box, Mr. Romel.

Is it the fact that you first became aware of problems with the gear box in July or August 1964?

A Yes.

Q And is it the fact that you became aware of them because Mr. Perrino brought them to your attention?

A Well, it was both him prompting me to take a look at the problem and also it was correspondence to that effect.

Q With whom?

A It was correspondence from Gomes, discussions with Mainelli.

Q In any event, over the next few months, you and others at Singer worked on a number of modifications to the gear box; is that not so?

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A Yes.

Q Among which were the addition of an Oilite bushing or bearing?

A Yes.

Q And a change in the bore shaft position?

A Trueing up of the center lines.

Q And a modification of the materials out of which the gears were made or a change in the materials?

A Yes.

Q And the addition of screws?

A Yes.

Q And then those gear boxes were tested, were they not?

A Yes.

MR. BENBOW: Objection.

THE COURT: Well, I will permit it.

Q Were they tested on cars or on test stands?

A On test stands.

Q Only?

A Mr. Perrino was given samples, and I believe he tested them on a car.

Q Do you know to what extent Mr. Perrino tested samples on cars?

A No, I don't know to what extent.

Q How many samples was Mr. Perrino given?

A I can't remember now.

Q And when was he given samples?

MR. BENBOW: Objection, your Honor. I don't think it is clear which samples we are talking about.

MR. GRAND: That we will get next.

THE COURT: I will permit it. Go ahead.

A I don't know exactly. It could have been late October or sometime in November.

Q Do you know which modifications were incorporated in the samples given to Mr. Perrino?

A Yes.

Q Tell us.

A I believe they included all of the modifications with the exception of the addition of the pinning of the gear.

Q And I believe you said you don't remember how many you gave to Mr. Perrino?

A No.

Q And you don't know how extensively they were tested, if at all?

A No, I know they were tested. I don't know to what extent.

Q And did you or Singer decide sometime in November or December that the performance of the gear box was satisfactory?

MR. BENBOW: Objection.

THE COURT: All right, I will permit it. Go ahead.

A I decided that the endurance testing on the test stand, that data accumulated, indicated that the wearing or premature wear problem had been basically resolved.

BY MR. GRAND:

Q I show you Defendant's 233 in evidence, which is a document dated December 21, 1964. It reflects --

MR. BENBOW: Dated what?

MR. GRAND: A document dated December 23rd, the second page of which is dated December 21st.

Q Prior to December 21st did you conclude that the mileage being accumulated on gearbox No. 23 was satisfactory?

MR. BENBOW: Objection, your Honor. I don't think the question is clear.

THE COURT: I think it is clear.

A I don't know, because the No. 23 still contained the brass pinion gear.

Q As of December 21st Singer was running test stand tests of gear boxes, is that correct?

A Yes.

Q And those test stand tests commenced when?

MR. BENDIX: Objection, not clear.

THE COURT: I think it is clear enough.

Q For example, this document, a summary of gear box tests contained within Defendant's 233, shows accumulated mileage of 69,000 on gearbox No. 23. When was that test started?

A Yes.

Q Does that refresh your recollection that the design was not frozen until approximately December 3, 1964.

MR. BENBOW: Objection, your Honor.

THE COURT: Let's see if it does refresh his recollection.

A This refreshes my recollection that we uncovered a problem there a problem concerning the torque.

Q And you encountered that problem at or about December 3, 1964?

A It could have been just prior to this.

Q Was any modification made in the design to solve the problem that you discovered concerning torque?

A Yes. I think the backlash was changed.

Q Were units built with this additional design feature, that is, gearboxes?

A Yes.

Q Some time after December 3, 1964?

A Yes.

Q Can you tell me when you commenced testing those gearboxes?

A No.

Q Can you tell me if you commenced testing such

gearboxes prior to December 21, 1964?

A Yes, I think we did.

Q Can you tell me how many miles you accumulated on those gearboxes prior to December 21, 1964?

A No.

Q Can you tell me how many miles you accumulated on those gear boxes before the Saturday meeting with Mr. Hough and others which you testified occurred some two weeks before December 21, 1964?

A No.

MR. BENBOW: Objection, your Honor.

THE COURT: He just answered no. I will let it stand.

Q Can you tell me, sir, whether you sent to Mr. Perrino in December, 1964 gearboxes with the design feature you just testified about?

MR. BENBOW: Objection.

THE COURT: No, I will permit it.

A I don't remember.

Q Do I recall your testimony this afternoon correctly that what you sent to Mr. Perrino were modified gearboxes but they did not contain the modification in the pin?

A Yes. They had the screw in the shoulder

A No, I think it was later.

Q What is your basis for thinking it was later?

MR. BENBOW: Objection. He has already answered it, I think.

THE COURT: No, I will let him answer it again. Go ahead.

A Well, because it was after the contract was signed and the inventory started coming in and we started getting involved in the manufacturing phase of setting up for manufacturing that I started to become more involved with details.

Q And it was not until when that you believed you first became aware of the problem of leaking pressure switches?

MR. BENBOW: Objection. Asked and answered, again, and form.

MR. GRAND: He has told us after June 18th.

Q Was it in July, August, September, October, November?

THE COURT: Answer the best you can.

A Probably around July.

Q How was the matter brought to your attention?

A Through correspondence that crossed my desk, and also discussions with both people at Singer, Quality

answered," not "asked and answered."

THE COURT: Go ahead. Do you know if Perma gave Wagner that information?

THE WITNESS: I couldn't be sure.

Q But, in any event, Wagner didn't pass the information onto you?

MR. BENBOW: Objection.

THE COURT: You have gone through that.

Q In any event, when you did become aware of the problem involving leaking pressure switches, certain steps were taken to remedy that problem; were they not?

A Yes.

Q And those steps involved the change in the angle of the chamfer?

A Yes.

Q Now, you mentioned a problem with repeatability.

A Initially, they just didn't meet the test stand spec.

Q What do you mean by that?

A Well, the subassembly of the pressure switch came in from the vendor. It was placed on the --

Q When you say the subassembly, what do you mean? You mean the whole pressure switch?

A Yes.

Q Okay.

A It was placed on the test stand and the opening pressure did not meet the specification. It exceeded it opened too soon at a higher value than what was specified.

Q Was that a problem that you talked about earlier having to do with cocking or the solution to which had to do with the way the contact ring cocked?

A No, that came later. I don't think initially this was really -- we were aware of this situation at all. It was simply taking a completed assembly that a vendor had shipped you, putting it on the test stand, activating the test stand, taking a reading and if it did not meet the specified reading, it was rejected.

Q All right. And thereafter --

MR. BENBOW: Objection.

Q What did you do thereafter?

THE COURT: All right.

A We contacted the vendor.

Q Rejected the switches. Was there ever a problem with repeatability?

A Yes.

Q When did you discover that problem?

A This was, I think, after the chamfer was

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changed, somewhere around October.

Q And how did that problem manifest itself?

A The parts were inspected 100% by the operator, placed in a stock box --

Q When you say the parts were inspected, do you mean --

MR. BENBOW: I don't think he completed his answer.

MR. GRAND: Before he gets on --

THE COURT: Let him go ahead.

MR. GRAND: All right.

A The pressure switch assembly --

Q As a unit?

A As a unit, was inspected 100% on the test stand by an operator.

Q You mean each pressure switch was put on a stand and tested?

A Right.

Q Okay.

A And adjusted at the same operation. It was then sample-inspected by the Quality Control Department or Quality Control inspector, and based on a statistical sample plan, he would reject a lot of work because he would find certain percentages of them that did not meet

the specification.

Q And it was after the rejection by Quality Control that the plastic sleeve was designed?

A Yes.

Q And the plastic sleeve was designed to solve the problem of non-repeatability of the pressure switch?

A To the cocking, yes.

Q And this design took place when?

A This was October, November '64, I guess.

Q And am I correct that a single size sleeve was selected and then samples were made?

A Yes.

Q Whose idea was the sleeve?

A I don't know. Mr. Perrino and I talked about the problem. I think it was a combination of thoughts, really.

Q HOw many samples were built, that is, prior to December 21, 1964?

A I couldn't tell you now.

Q Can you give me an estimate Less than five?

A There was a --

MR. BENBOW: Objection, your HOnor.

THE COURT: No, I will permit it.

A There was a temporary mold constructed, if I

the page?

MR. GRAND: "We made sample parts and retested switches with this modification and it appeared the problem had been solved."

THE COURT: I will permit it. Was there any other basis other than these tests?

THE WITNESS: Not that I could recall.

THE COURT: Okay.

Q Do you recall, sir how soon after December 21, 1964, you became aware of problems involving the pressure switch and specifically involving the plastic sleeve?

MR. BENBOW: Objection.

THE COURT: No, I will permit it.

A Well, first of all, it entailed more than just a plastic sleeve but --

Q But it also entailed a plastic sleeve, didn't it?

MR. BENBOW: He is in the middle of an answer.

THE COURT: Let him answer. Don't argue with him.

A I don't know. I think the first indication was from Mr. Kelley from Monitor, in terms of field complaints

Q When was that?

A January or February.

Q Within a matter of a month or so after the

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December 21 contract?

A Well, that was related to setting of the switches. The question was raised by Mr. Kelley whether different settings were required for different makes or models of vehicles.

Q I didn't raise the question of Mr. Kelley, you did. I asked you when you first encountered problems with the plastic sleeve, and you are talking about Mr. Kelley and settings.

MR. BENBOW: Object to that, your HOnor.

THE COURT: I think he is trying to get there. Let's let him go.

Go ahead.

A What I am trying to get at is, it wasn't until --

Q Let me see if I can't help you, all right?

A All right.

THE COURT: Do you have a document?

MR. GRAND: Yes, the transcript.

THE COURT: All right.

MR. BENBOW: Can he finish?

Q Didn't you discover in January or February that there were problems being encountered with the pressure switches that were showing up in the subassembly tests and wasn't Quality Control rejecting pressure

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switches in January or February '65?

A Yes, but at that time we didn't know what the problem was.

MR. BENBOW: What's the document?

MR. GRAND: What's the document? The transcript, 4869 and 70.

MR. BENBOW: Thanks for telling us.

Q You discovered shortly after, did you not, that some of the problem related to the plastic sleeve?

A Well, changing of it tended to correct the situation, but the problem was related to temperature variations which could have been in the existing plastic housing also. There were also problems relating to the hysteresis in the O-rings and the frictional characteristics of the piston arrangement.

Q And you modified the dimensions of the plastic sleeve in 1965 as a result of some tests that were conducted, did you not?

A Yes; we also changed the O-rings.

Q The tests that you have referred to, the heat and temperature tests, none of those were conducted by Singer in 1964, were they?

A No, I don't think so.

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jha6 Romel-cross

THE COURT: All right. Would it or wouldn't it?

A It would lead to, as Frank Perrino described to me, a gradual softening of the pedal, and eventually the fluid would leak out, if it was that bad a leak. I don't know.

Q You say as Frank Perrino described it to you. You knew that, didn't you?

MR. BENBOW: Objection.

THE COURT: No, I will permit it. Did you know that at the time?

A Well, if something is allowed to continue to keep leaking I would know that eventually you would lose all the fluid.

THE COURT: Okay.

Q Did you understand the leaking of O rings to be a very serious problem which could lead to a brake failure in September, 1964.

MR. BENBOW: Objection, your Honor.

A No, I will permit it.

MR. BENBOW: The past answers have already covered this period, it seems to me.

THE COURT: I will still permit it. Go ahead.

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A Well, I think I just answered that. Eventually if you allowed a leak to continue leaking eventually you would lose all the fluid.

THE COURT: And you knew that in September, '64, right?

THE WITNESS: Yes.

THE COURT: Okay.

Q And you also knew in September, 1964, did you not, that none of the so-called fail-safe features which Mr. Perrino described to you would overcome such a leak?

MR. BENBOW: Objection.

THE COURT: No, I will permit it.

A Well, I think during that period of time the thing was to correct what was ever causing the splitting O rings and that once it was corrected that based on the testing that had been done up at Perma and othere places that the probability of this occurring under use was very, very remote.

THE COURT: But you didn't focus on this problem at all as formulated by Mr. Grand in his last question?

THE WITNESS: No, I didn't dwell on it. I dwelled on getting answers to the questions that affected getting the production and manufacturing going. As in

same as far as the cost aspect was concerned.

Q Were you aware in 1964, prior to December, of a condition known as vacuum bind?

A Yes.

Q What is vacuum bind?

A Well, this would be a condition where the vacuum would pull the rotary valve against the wall and create a hesitation in its turning or return.

Q Could vacuum bind prevent the return from the vacuum position to the atmospheric position?

A That would depend on how severe this was. At the time --

Q What time are you talking about?

A This was around September, '64. There was a lot of question in Mr. Perrino's mind as to whether or not it was significant enough to create a problem. In fact, I think I remember him taking a half a dozen units for evaluation to try to determine this.

There was also a lot of -- I don't want to use the word confusion, but there was a lot of discussion about vacuum bind or mechanical bind. It really wasn't that clearly defined at that particular point in time.

Q But you knew there was a condition called vacuum bind, is that correct?

THE COURT: The answer obviously is yes.

A Yes.

Q And you knew that it affected the functioning of the rotary valve, is that correct?

MR. BENBOW: Objection.

THE COURT: I think he has answered it already.

Q That condition was observed, was it not, during the September meetings at which various units were disassembled and examined?

THE COURT: No, I will permit it.

A It was observed on some units, but it was a situation that --

Q The question was was it observed.

A -- it had to be more or less created. It was an erratic condition and one which was -- what I would term caused a hesitation. This would be --

Q On --

A I think it was observed without the governor turning.

Q How was it induced?

A I don't remember exactly. I think it was -- the terminology was used interchangeably with mechanical and vacuum and I think there was quite a bit of

system when the engine was not operating?

MR. BENBOW: Objection.

THE COURT: No, I will permit it.

A I don't really remember. I don't remember whether the material was really analyzed. That's the best I can do.

Q Now, there was another kind of contamination observed with respect to the sensing units, was there not?

A Yes.

Q Do you want to describe that kind of contamination?

A Well, it took the form of basically two sources. One was from where on the internal parts themselves. The other was material which came in through the coupling of the sensing unit.

THE COURT: What were those two words?

THE WITNESS: The coupling of the sensing unit.

Q That is the coupling --

A Between the drive cable and the sensing unit drive shaft.

Q And the contamination consisted of what materials?

MR. BENBOW: Objection. Asked and answered.

THE COURT: No.

A As best as I could recall, there were steel

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shavings, graphite, I think that was from the cable, and brass shavings from internal parts of the unit, brass or copper. I don't remember right now which.

Q And grease?

THE COURT: He didn't say grease. Are you asking whether there was grease there, too?

MR. GRAND: Yes.

THE COURT: Was there?

THE WITNESS: I said graphite.

Q How about grease?

A There was one unit that I recall had a mixture of transmission fluid and I guess it was grease from the gear box.

Q There was only one unit on which you observed grease from the gear box?

A This was the '64 Chevy, I believe, the Singer car.

Q That was the car on which a unit was installed prior to December '64?

A Yes.

Q And the unit was removed from the car at some point?

A Yes.

Q Also prior to December '64, that is, prior to

December 21?

A Yes.

Q And when it was removed, was it found to be full of graphite, grease, metal particles and transmission fluid?

A Yes.

Q In addition to that unit, were there not other units, sensing units, that were being tested in which grease was found?

MR. BENBOW: Objection.

THE COURT: If he remembers, he can answer it. Do you remember any others?

THE WITNESS: Well, there was lubrication in the units, so the ones that were tested were done on a test stand, those that weren't hooked up to a transmission, so there was no fluid or anything like that.

Q Was grease noticed in those, other than that which belonged in the sensing unit, because it was placed there as lubricant?

MR. BENBOW: Objection.

THE COURT: No, I will permit it.

A I don't think so.

Q Take a look at Plaintiff's 53 for Identification, particularly the sentence beginning with " The amount of

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THE COURT: All right, mark it in evidence.

(Plaintiff's Exhibit 53 received in evidence.)

BY MR. GRAND:

Q Now, in addition to observing the contamination in the unit removed from the station wagon, the Singer station wagon, prior to December 21, 1964, you had observed contamination in sensing units being tested on test stands prior to December 21, had you not?

A Yes.

Q And had you also complained to Perma representatives about this problem?

A Yes, I did.

Q And prior to December 21, 1964 --

MR. BENBOW: May he finish, your Honor?

THE COURT: I thought Mr. Romel was finished.

THE WITNESS: No, I was about to say that --

MR. GRAND: I don't really see, your Honor, why, when I ask questions with a lot of care, to elicit a yes or no answer, I have to be inundated with a flood of whatever he or his lawyers wants to tell me, if I may.

THE COURT: Ask your questions and say, "Yes or no" at the end of them, to make it simple.

MR. BENBOW: Your Honor, can he finish his answer?

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Q Did you think it was acceptable to have units filled with grease, metal shavings and transmission fluid?

MR. BENBOW: Objection.

THE COURT: I will permit it, but I don't think it really needs to be asked. Go ahead, answer it.

A No.

Q By the way, that unit removed from the station-wagon no longer cycled, did it?

MR. BENBOW: Objection.

THE COURT: Do you remember?

THE WITNESS: Yes. It did not.

THE COURT: All right, answer it. It did not?

THE WITNESS: It did not cycle.

THE COURT: You folks have asked for a morning break. Let's take it now.

MR. BENBOW: Thank you, your Honor.

THE COURT: Ten minutes.

(Recess.)

BY MR. GRAND:

Q Mr. Romel, prior to December 21, 1964 did Perma supply Singer with a suitable design change to

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overcome the contamination problem?

MR. BENBOW: Objection.

THE COURT: No, I will permit it.

A Mr. Perrino was of the opinion that --

Q Would you answer my question, please?

THE COURT: Did they provide you with a suitable design change. Yes or no.

A No.

Q Prior to December 21st the Singer Company tried a number of different things in an effort to solve the problem, did it not?

A Yes.

MR. BENBOW: Objection.

THE COURT: I will permit it. Go ahead.

A Yes.

Q Prior to December 21, 1964 had Singer solved the problem?

A I believe we had several workable solutions, yes.

Q Were those --

A There were varying degrees of the problem. Some of the units that were on test exhibited no contamination, others did in varying degrees. We had been putting in various washers and things of this nature

to constrain this and at that time it appeared to me that it was not a difficult problem to resolve.

Q The presence of contamination in the units on the test stand was observed both shortly prior to December 21st and shortly after December 21st, is that not true?

A There were some units that were -- continued to run that did not have modifications in them.

THE COURT: You saw contamination after December 21st?

THE WITNESS: I am not sure. I would like to see if we have a data sheet.

THE COURT: Do you have a data sheet on it?

MR. GRAND: The question is whether he saw contamination immediately after December 1st?

THE COURT: That's right. He indicated he saw it before December 21st.

MR. GRAND: I think I can help in that matter.

Q You may recall, Mr. Romel, that at page 4930 you were asked:

"Q What was the first thing you did with respect to the sensing unit after December 21, 1964, if you recall?

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"A Endurance testing relating to the contamination problem."

Do you recall that?

A It was a continuation of the testing that had been started prior.

Q Am I correct that the tests started prior to December 21st on the sensing unit were not completed by December 21st and continued thereafter?

MR. BENBOW: Could I hear that question?

THE COURT: Yes, sure.

(Question read.)

A There were varying degrees of mileages accumulated and they were continued afterwards to obtain a total figure for mileage expectancy.

THE COURT: But did it start before December 21st?

THE WITNESS: Yes.

THE COURT: And did it continue thereafter?

THE WITNESS: Yes.

THE COURT: Okay.

Q As of December 21st did you have an adjustment as to an acceptable amount of mileage to be obtained on a sensing unit.

MR. BENBOW: Objection.

THE COURT: No, I will permit it.

A Yes.

Q What was that?

A Well, it wasn't a finite figure because of the accelerated testing that was being done. In order to expedite results we were running these at various speeds, 80 miles an hour and I believe 72 miles an hour. The mileages that were accumulated there prior to December 21st were in the order of -- I don't know whether they were 60,000 miles or something like that or something a little less than that.

Extrapolating to the effect that the normal use would not be used at these accelerated speeds, it was reasonable to expect that the life would be considerably exyended in normal use.

Q Do I understand you to be saying that attaining some 60,000 miles on the test stand indicated to you acceptable endurance or life for the sensing unit?

A No. It indicated to me that we would expect that the problem was being resolved or had almost been resolved, it was a matter of time to accumulate additional mileage.

Q Now let me show you Defendant's 234 in evidence, which is endurance testing of the sensing unit

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dated December 28, 1964, and ask you if that refreshes your recollection that the mileages varied between 7 and 20 thousand and had not accumulated as far as 60,000 until approximately February of '65. I show you Defendant's Exhibit 236 in evidence in that connection as well.

A Well, I think there may be other test information that is not included in here.

Q Can you tell me where that other test information is, sir?

A Right now I couldn't, no.

Q You will notice that on Defendant's 234, dated December 28th, it starts with unit No. 1. You see that?

A Yes.

Q Were there units tested before you met No. 1?

A Yes, there were.

Q And what design configuration did the units tested prior to the commencement of tests on unit No. 1 have?

A I couldn't say right now.

Q Were there any modifications to the units numbered 1 through 6 appearing on Defendant's 234, sir, that were being tested for the first time?

A I would have to say yes, because we were con-

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tinually trying new washers.

Q So that as of December 21, 1964 the units with the configuration that the units had on 234 had not achieved a level of mileage indicating to you a satisfactory life or endurance, is that not correct?

MR. BENBOW: Objection.

THE COURT: No, I will permit it. Go ahead, answer it.

A Well, like I said before, I can't determine from these documents whether this is additional testing or what it was. All I remember is that the results that we were getting were very promising and we continued to run the test. I was of the opinion that we were basically resolving the problem.

Q You will notice on 234 thst unit No. 5 had accumulated mileage of some 20,000 miles. You see that?

A Yes.

Q And you will notice that on Defendant's 236 unit No. 5 failed at 25,000 miles. You see that?

A Yes.

Q When did it fail in point of time, do you recall?

A Well, it would have been about the time of the date of the memorandum.

Q It took over a month to accumulate 5000 miles?

A It shouldn't have, but I don't remember now.

Q You will notice that when it failed examination revealed that it and the other failing units were highly contaminated with foreign matter. You see that in Defendant's 236?

A Yes.

Q Did you examine unti No. 5 at or about December 21, 1964?

MR. BENBOW: Objection.

THE COURT: No, I will permit it.

A I don't remember whether I did personally or not.

Q Did you observe any contamination in that unit at or about December 21, 1964or did anyone else report to you that he had observed such contamination at the 20,000-mile mark?

MR. BENBOW: Objection.

THE COURT: At or about December 21, 1964, right?

MR. GRAND: Yes, your Honor.

THE COURT: I will permit it. Go ahead and answer it.

A Yes, there were units that were examined at very high mileages that had exhibited no contamination at the higher mileages.

Q You understand I am talking about the ratio between 20,000 and 25,000 and the question was did you in your experience find any units that failed at 25,000 miles which had no evidence of contamination at 20,000 miles.

MR. BENBOW: Objection, your Honor.

A I couldn't remember now specifically all these numbers, but the earlier units exhibited contamination in less than 5000 miles --

Q You are not even trying to answer the question.

THE COURT: I am not sure he understands it.

Q Some of the modifications about which you have spoken, washers of various kinds, were installed in units that were mounted on test stands in early December, 1964, is that not so?

A Yes, and probably prior to that.

Q But some were installed in early December?

A I couldn't tell you for sure. I would assume so , yes.

Q And those that were modified in December were running at the time of the Saturday meeting with Mr.

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Hough, were they not?

A Yes.

Q Can you tell me the consequence of metal particle contamination in the unit?

MR. BENBOW: Objection.

THE COURT: I will permit it. Do you want all of them? There is more than one.

MR. GRAND: I would be happy to have any one he wants to tell me about.

THE COURT: Okay.

A Well, one situation would cause a short preventing the unit from operating or functioning at all.

Q When you say a short, what kind of a short?

MR. BENBOW: Can he be permitted to finish the other answer before we go to the next one, your Honor?

THE COURT: No. Go ahead, answer it. Tell him what kind of a short.

I assume you mean an electrical short, right?

THE WITNESS: Yes.

THE COURT: Okay.

A Another possibility --

Q Can you tell me an electrical short where,

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Q Did you discover the problem of the cam gear hanging up in August or September 1964?

MR. BENBOW: Objection.

THE COURT: I will permit it. Go ahead, answer it.

A No, this was discovered by our Quality Control inspector.

Q When was it brought to your attention?

A Around August, I guess.

Q You knew at that time, did you not, that the cam gear was part of the fail-safe feature of the unit?

MR. BENBOW: Objection, your Honor. It seems to me we have covered this yesterday.

THE COURT: I assume it is leading up to something. I will permit it.

Did you or did you not?

THE WITNESS: I knew it was one of several.

Q And you knew, did you not, at that time, that its return was necessary to disarm or disengage the system?

MR. BENBOW: Objection.

THE COURT: No, I will permit it.

A Yes.

Q Now, when the problem of cam gear hangup was

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brought to your attention, it was your judgment that the design was a marginal design situation, was it not?

MR. BENBOW: Objection.

THE COURT: No, I will permit it. Go ahead.

A It was my judgment that the angle --

Q Can you answer my question?

A I am.

Q All right.

A It was my judgment that the angle should have been made steeper to decrease the normal forces on that plane.

Q You made certain calculations and exercised your engineering judment concerning the angle of the cam gear, did you not?

MR. BENBOW: Objection.

THE COURT: Go ahead, answer it.

A I made a free body diagram of the cam surface with a vector analysis of forces.

Q And you determined, did you not, that the angle of the cam gear should really be changed because it was a marginal design situation, is that not so?

MR. BENBOW: Objection.

THE COURT: No, I will permit it.

A It --

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Q Yes, or no?

A Yes, I recommended this to Mr. Perrino.

Q You determined, did you not, that the angle should be changed because it was a marginal design situation?

MR. BENBOW: Objection.

Q Is that correct?

THE COURT: I don't understand, Mr. Grand, why you are hanging up on the words "marginal design."

MR. GRAND: They are his words, Judge. I kind of like them. They appear at 4340 of the transcript.

THE COURT: All right, then leave it there.

Q Now, the angle of the cam gear was not changed, was it?

A No, the surface finish was changed.

Q We'll get into that. I understand that. The angle was not changed?

A No.

Q At any time prior to December 21, 1964?

A No, the surface was highly polished and --

THE COURT: No, was the angle changed before December 21, 1964?

THE WITNESS: No, it was not.

Q Was it changed after December 21, 1964?

development work in determining the right combination of spring, and that had to be left alone. Incidentally, the calculations --

Q I really don't want incidentallies.

THE COURT: No, just hold it.

Q Didn't Mr. Perrino agree with you that the angle of the cam gear should be changed?

MR. BENBOW: Objection.

THE COURT: No, I will permit it.

A No, I don't think he did. He said it should be looked into possibly at a later date, but that the polishing would handle it.

THE COURT: Okay.

Q Let me read to you, sir, from Transcript 4341:

There is a reference on Line 7 that omits the speaker, but the question is:

"So what did he say to you?

"THE WITNESS: He told me that he agreed, but this would entail redesigning of the parts of the microswitch spring and so forth, and that he had done a great deal of development work in this area, had spent many, many hours developing just the right spring combination, and that he would consider this for the future."

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that is enough.

MR. BENBOW: I am sorry, your Honor. It was meant as an objection.

Q Can you tell me, sir, what tests were performed on sensing units with cam gears modified to adopt a shortened slot and a polished surface prior to December 21, 1964?

A This entailed placing the unit on the sensing unit test stand, lowering the speed with a Variac, and actuating the unit and observing whether it stopped, did not keep repeating.

Q Now, maybe we can shorten this. You may recall at 4348 and 4349, in response to some questions by the Court, that you testified that you so tested approximately five samples for a half a day. Do you recall that or do you want me to read all the testimony to you?

MR. BENBOW: Wait a minute.

THE COURT: Let me see it. Give it to me.

MR. BENBOW: Your Honor, while you have the transcript, I would call your attention to Page 4341 which was just read from also, sir, and the question following what Mr. Grand read.

THE COURT: All right. What's your next question?

MR. BENBOW: Objection.

THE COURT: No, I will permit it. Go ahead Did you tell him that?

A No, I thought the testing was adequate, as Mr. Perrino had told me.

THE COURT: But you did not tell him that, is that correct?

THE WITNESS: No, I didn't tell him that.

Q Did you tell him that you did not fully understand the unit?

MR. BENBOW: Objection.

THE COURT: I will permit it.

A No.

Q In your judgment, did you fully understand the unit at the time of that meeting?

A No. I wouldn't have called Mainelli in '65 asking him questions about field complaints if I did.

Q But you didn't tell Mr. Hough that you did not fully understand the unit, correct?

MR. BENBOW: Objection.

THE COURT: That is what he said.

Q Prior to that meeting with Mr. Hough had you

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BY MR. GRAND:

Q Can you tell me whether you received a copy of the Dupont report sometime after March 11, 1965, and I am showing you a copy of what is, I think, Defendant's 13 for identification, to ask you if that refreshes your recollection.

Specifically, I refer you to the "received" stamp on the top of the page.

MR. BENBOW: Are you offering it with the "received" stamp, Mr. Grand?

THE COURT: I don't believe so.

Q Do you understand the question?

A Yes, you asked me whether I received a copy of this.

Q I assume you received a copy, and I asked you whether you received it after March 11th. Is there any question in your mind that you received a copy of a Dupont report?

A No, there is no question that I received one.

Q All right. Did you get it after March 11, 1965?

A Yes, I believe so.

Q Can you tell me how much after March 11, 1965?

A No.

Q And am I correct that Mr. Patten gave you

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instructions to analyze the failure modes contained in that Dupont report?

A Yes, he did.

Q And can you tell me when he gave you those instructions?

A It's when he sent up a copy of the report. It was shortly after he received it, I'm sure.

Q And your analysis was limited, was it not, to the failure modes described in that report?

A Yes.

Q And your analysis was a completely theoretical one, was it not?

MR. BENBOW: Objection.

Q That is to say, you did not evaluate the probability of any of the failures which you analyzed?

THE COURT: All right, that question I will permit.

A I made some comments to that effect, but for the most part it was an objective type of analysis.

Q Do you remember the Court asking you on Page 4617:

"This is strictly on a theoretical plane you were doing this, right?

"THE WITNESS: Yes. This would be without

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considering any probability, analyzing the system itself, if this happens, what is the effect, and so on."

Do you recall giving the Court those answers?

A Yes.

Q YOu don't want to change them in any way, do you?

A No.

Q And now, at a subsequent date you performed an analysis of the fail-safe design on a more inclusive basis, did you not?

A Yes.

Q And you did that for the first time in August 1965.

A Yes, I believe so.

THE COURT: Do we have a copy that we can show to him?

MR. GRAND: Your Honor, you may recall that I showed him one and it turned out he said that was the second one, and the first one was in August.

THE COURT: All right.

Q And that analysis was in mid-August of 1965?

A Around that time, I believe, yes.

Q And was that analysis made on the instruction of any one person?

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A Yes, I believe that was, yes.

Q Mr. Person personally instructed you to do that, is that correct?

A Yes, I believe so.

Q And when did he give you that instruction?

A It was shortly after I sent or had a copy sent of the July status report. That is Exhibit 577.

Q And that document is dated July 22nd, I believe?

A Yes.

Q So sometime between July 22nd and mid-August, Mr. Person instructed you to do a fail-safe design analysis?

A Yes.

Q Do I also understand you were on vacation during the last two weeks of July and the first week of August?

A Somewhere around that time, right.

Q Did you commence work after your return from vacation?

A Yes.

Q And after you submitted your fail-safe analysis, did you receive instructions from Mr. Person to develop solutions to the fail-safe problem?

A Well, he had asked me what we were doing. I told him we had already started some work in this area,

but he wanted, I guess, you would call it, a more formal approach.

Q Did he give you instructions to commence a two-phase program aimed at developing solutions to the fail-safe problem?

A Yes.

Q And did he do that in late August or early September?

A Yes.

Q Did you at that point in time do a complete failure mode analysis of the components or parts of the Perma anti-skid device?

MR. BENBOW: Objection, your Honor.

THE COURT: I will permit it. Go ahead.

A Not every single part, no.

Q Did you do a complete system analysis of the anti-skid device at that point in time?

MR. BENBOW: Objection, your Honor.

THE COURT: I will permit it. Go ahead.

A I covered as many aspects that I could think of at the time.

Q Was it complete?

MR. BENBOW: Objection.

THE COURT: I will sustain that. It was as

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THE COURT: Okay.

Q By April of 1965 you were in complete charge of all engineering aspects of the Perma program, were you not?

A Yes.

Q Neither Mr. Perrino nor Mr. Mainelli had any charge of those matters, did they?

MR. BENBOW: Objection.

THE COURT: No, I will permit it.

A I used them for consulting and I made the final decision.

Q You used them for consulting until you decided that Mr. Perrino was altogether unreliable a month later, isn't that correct?

MR. BENBOW: I object.

THE COURT: I don't think he testified to that, Mr. Grand. He just said --

MR. GRAND: You remember the renewal of the service contract, your Honor?

THE COURT: Yes, I remember.

Q After obtaining the oscillograph in June you ordered additional items to be used with the oscillograph thereafter, did you not?

A Yes.

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Q Throughout the year 1965 were you in charge of the engineering for the Perma project?

A Yes.

Q That is from December 21, 1964 throughout the year 1965?

A Yes.

Q And right up to whenever it was in 1966 that you were pulled off the project and reassigned?

A Yes.

Q I gather then that at no point was responsibility for engineering or design of the project transferred to the Denville Research & Development Laboratory.

A They did an evaluation in --

Q I know that they did certain specific things. I wish you would keep the question in mind.

A I don't know if they did anything over and above what I am aware of.

Q And what you have already testified to?

A Yes.

Q But so far as you know, they were not assigned responsibility for engineering and design of this project, is that correct?

MR. BENBOW: I object to that, your Honor.

THE COURT: Read it back.

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talking about prototyping. You require more than just contacts in the industry. But he did mention it. Let's go on to something else.

Q An automotive engineer was never hired by the Singer Company, is that correct? That is, to work on the Perma project.

A No, I interviewed one or more people, but they did not accept the position.

Q So that none was hired?

A No.

THE COURT: Are you going to move onto something else?

MR. GRAND: Yes.

THE COURT: I am going to give the witness a break. Because I am going to give you a break, the rest of them get it, too. Take ten.

MR. BENBOW: Thank you, your Honor.

(Recess.)

BY MR. GRAND:

Q The Dupont analysis or Dupont report which you received sometime in March of 1965 triggered an investigation into all of the areas which were mentioned in the report, did it not?

A Yes.

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Q And after reviewing that report were you instructed to conduct or have conducted tests of each of the items mentioned therein?

MR. BENBOW: Your Honor, I thought this was covered earlier today.

THE COURT: I think it was, but I think it is preliminary.

MR. GRAND: No.

THE COURT: No?

MR. GRAND: No, it wasn't covered. What we talked about earlier was what his analysis was, not his testing of components.

THE COURT: All right. Go ahead.

Q Do you have the question in mind, Mr. Romel? If not, we will get you one.

A No, I don't.

THE COURT: All right. Read the question.

(Question read.)

A Yes.

Q And thereafter tests were conducted on the pressure switch, is that correct?

A Yes, also the components, I believe.

Q And also tests were conducted and an effort was made to improve the rotary valve function; is that

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correct?

A Yes.

Q And tests were conducted on filters?

A Yes.

Q And there was an effort made to upgrade their performance as well?

A Yes.

Q And tests were conducted on the ball pivot in the sensing unit; is that correct?

A Yes.

Q And tests were conducted on the strength and reliability of the governor spring?

A Yes.

Q And tests were conducted on the solenoid spring?

A Yes.

Q And each of those subjects was raised by the Dupont report, were they not?

MR. BENBOW: Shouldn't he be shown the report, your Honor?

THE COURT: Yes, I think so. Give him a copy.

MR. BENBOW: Since all of this is apparently conceded, shouldn't this document come in?

THE COURT: I don't know.

A All, with the exception of the rotary valve.

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I don't see that mentioned in here.

Q All right. Is it fair to say that the tests that were conducted were to determine the reliability of the components that you have mentioned and the probability of their failure?

MR. BENBOW: Objection, your Honor. The document states otherwise.

MR. GRAND: I am not talking about the document.

THE COURT: He is talking about the tests, right?

MR. GRAND: Yes.

THE COURT: All right, I will permit the answer.

A To try to ascertain the extent, yes.

Q By "~~extend~~ extent", you mean the likelihood of failure of a given part?

A Yes.

Q Was the sticking problem of the rotary valve ever solved to your satisfaction?

MR. BENBOW: Objection, your Honor.

THE COURT: No, I will permit it.

A No, I don't believe it was.

Q Was a filter acceptable to you for the sensing unit ever arrived at?

A No.

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Q As of July 22, 1965, sir, had new specifications been developed for filters?

THE COURT: Wait a second. Is that the date of that report, Mr. Grand?

MR. GRAND: Yes.

THE COURT: All right. Do you know, MR. Romel?

MR. BENBOW: Is there a page reference?

THE WITNESS: No, not offhand.

Q Was it your judgment as of July 22, 1965, that new specifications had been developed for the filters which should afford the required protection?

A I don't remember.

Q Will you take a look at Item No. 2 on Page 16 and see if it refreshes your recollection?

A The situation here required that they be changed every 5,000 miles.

Q Is that a specification of which you approved, sir?

MR. BENBOW: I object to the question.

THE COURT: I will permit it.

A No, I don't believe as of this time a decision had been made whether or not making a requirement like this in the field was acceptable or not from a field service or marketing point of view. It was simply a

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statement of fact as to what some of the testing had indicated, that there was still a question of doubt and that it appeared that they had to be changed.

Q The document says, "OUr field servicing manual will specify that filters must be changed every 5,000 miles or six months, whichever comes first."

Do you see that there?

A Yes, I see that.

Q That was not based on any decision made by anybody?

MR. BENBOW: Objection, your Honor.

THE COURT: No, I will permit it. Go ahead.

A The inference is that it would be or could be, depending on whether this kind of condition was acceptable.

Q In your report, you did not specifically point out, did you, that that might be an unacceptable condition or that it raised such a question in your mind?

MR. BENBOW: I object, your Honor.

THE COURT: The document is in evidence?

MR. GRAND: Yes, it is, your Honor.

THE COURT: Isn't there another document concerning tests with filters and oil and so on and so forth?

MR. GRAND: There is, your Honor, That is in

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evidence. I don't know where it is at the moment.

MR. BENBOW: We can get them if you would like, your Honor. There are three of them, I believe.

THE COURT: No, go ahead.

Q I want to turn your attention to the transfer valve, Mr. Romel. Was the purpose of the adoption of the transfer valve to obtain increased pressure output from the Perma-Vac?

A Yes. It had to do with its relationship with the displacement problem, also. The two problems were inter-related in that respect. The displacement had to be increased and when that was done, this resulted in reduced pressures without the transfer valve, so this was suggested by Frank Perrino to handle both problems.

Q Was there a more direct approach to the problem that occurred to you?

MR. BENBOW: I object, your Honor.

THE COURT: No, I will permit him to answer the question. Do you understand the question, sir?

THE WITNESS: Yes.

A At that time I thought the spring force should be increased.

Q In the can?

A Yes.

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12 jksr

Q And you recommended that to Mr. Perrino, did you not?

A Yes, I did.

Q Did you also consider increasing the size of the can at that point in time?

MR. BENBOW: Objection.

THE COURT: No, I will permit it.

A I don't remember.

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Q When did you have the discussion with Mr. Perrino in which you recommended to him the increase in the size of the Perma-Vac spring and he told you in words or substance that that wasn't necessary and that the transfer valve would be a better solution?

A I think this was in late February or March.

Q That was after the transfer valve was already in existence, was it not?

A No.

Q I want to show you some testimony. You were asked at page 5104:

"Q What did you say to Mr. Perrino and what did Mr. Perrino say to you at this time on the topic of enlarging the Perma-Vac can?

"A Well, I suggested that we change the spring and also change the size of the can."

Let me just stop there for a moment. Does that refresh your recollection that you recommended not only an increase in the size of the spring but an increase in the size of the can?

A Yes.

Q Let me go back.

"Well, I suggested that we change the spring and also change the size of the can, and he said that this

would only delay the program because the spring had been developed with a great deal of time and effort in developing the right combination of spring and can size, and that with the introduction of the transfer valve, he said this would take care of the immediate problem and also take care of the problem of the future disc brakes."

Now, is it your testimony that that conversation took place before the transfer valve was designed?

MR. BENBOW: Mr. Grand, in the previous page that you started reading from there is a time reference which is more explicit, it seems to me, and establishes just that. You see the question and answer at line 16 to 19?

MR. GRAND: It says "prior to the introduction."

Q Can you tell me, sir, how you had a conversation with Mr. Perrino about the transfer valve and the preference of the transfer valve to an increased spring and can prior to the design of the transfer valve?

A It wasn't prior to it.

Q Oh. It was after the transfer valve was designed, is that your testimony?

A He already had the concept and told me that he had working models of it.

Q And had you seen working models of it at that

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point in time?

A No. This is why I invited him to come down to Elizabeth, which he subsequently did.

Q Prior to that time, that is, the time of this conversation, had Perma submitted to Singer a proposed design change involving increasing the size of the Perma-Vac spring?

A Yes. I requested this at one of the technical services letter requests. But I don't know whether -- when that came down, really.

Q Did you request that, sir, in your letter of December 23rd, namely, Plaintiff's Exhibit 56A?

A I don't see any reference specifically to a spring. What was said in here was that the documented engineering data should be supplied on locking pressures for single-piston vehicles and that if this information indicated thatthe specification --

Q Don't just read me the document.

A I am not reading it.

Q Please don't paraphrase it. Have a look at --

A Let me finish what I am saying.

Q Have a look at paragraph B on page 2 and tell me if by that paragraph you asked for an investigation and recommendation of possible design changes to yield

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increased pressures.

A Yes, in the event that the item or information listed in item A indicated that this was necessary. The two are related.

Q In other words, as of the date of this letter, December 23, 1964, you were not persuaded that the pressure output of the Perma-Vac was adequate, is that correct?

MR. BENBOW: Objection, your Honor.

THE COURT: Reframe the question.

Q Prior to December 21, 1964, sir, immediately prior to December 21, 1964, did you question the adequacy of the pressure output of the Perma-Vac spring?

MR. BENBOW: Objection.

THE COURT: No, I will permit it.

A I think it was more like in November, the end of November.

Q What was more like the end of November?

THE COURT: Is that when you questioned the adequacy?

THE WITNESS: I questioned why we couldn't meet the 700 psi on the test stand and it was a result of these discussions where Frank Perrino said we could drop it down to 600 psi. I think officially this was done

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by letters in early December.

Q And as of two days after the December contract you were asking Mr. Perrino to investigate and recommend possible design changes to increase the yield of the Perma-Vac, were you not?

A Well, first of all --

Q Were you not?

A First of all --

MR. BENBOW: Objection, your Honor.

MR. GRAND: I really thing I am entitled to an answer.

THE COURT: I don't think you are entitled to an answer because the document speaks for itself. The document specifically says, "Investigate and recommend possible design changes which would increase the yield of single-piston-type Perma-Vac units," so on and so forth.

MR. BENBOW: Have you read the last sentence of that paragraph, your Honor?

Q Do you recall your testimony yesterday, sir, to the effect that after Mr. Perrino told you of the adequacy of the 600 pounds output you had no further question on the subject?

MR. BENBOW: I would like to hear that question again, please.

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THE COURT: Sure.

(Question read.)

MR. BENBOW: Do you have a page on that?

MR. GRAND: I do not.

MR. BENBOW: Then I object to it.

MR. GRAND: Maybe that accurately states his testimony.

Q Can you answer the question?

THE COURT: The objection is overruled.

Q That means you can answer the question.

A I don't remember what I said exactly.

Q We will find it for you.

THE COURT: Can you go on to something else while Mr. De Rensis is looking it up?

MR. GRAND: All right.

Q Prior to February, 1965 did you receive a design change recommendation regarding the Perma-Vac spring from Perma?

MR. BENBOW: Objection, your Honor.

THE COURT: No, I will permit it. Go ahead.

A I recall something in one of the answers I got from Mr. Mainelli. I don't know exactly when that was.

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Q Let me show you something that is marked Defendant's 243 for identification, I believe, and ask if that refreshes your recollection, specifically, item H, that a design change recommendation regarding Perma-Vac was submitted.

THE COURT: Don't read it. Is it in evidence or not?

MR. GRAND: I don't know.

THE COURT: Find out.

You showed him the document. Does that refresh your recollection as to whether a design change in the spring was suggested?

THE WITNESS: No.

Q Can you tell me what this two-page document is?

A I don't recognize it.

Q You have no idea what that document is?

A It appears to be a listing of information, engineering services that were obtained from Perma.

Q Does it appear to you to be a document prepared by the Singer Company?

A I don't know. There is no signature on it.

Q Are you saying you have never seen that document before?

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A I am not sure.

MR. GRAND: I am going to offer it, your Honor. It is dated February 11, 1965. It apparently was an attachment to a letter dated February 17, 1965, which is Plaintiff's Exhibit 63 in evidence, which is a letter from Carl Broeker to Mr. Phelps, manager marketing and diversification, the Singer Company. I am giving that to defense counsel so they can have a look at that also.

MR. BENBOW: Your Honor, we haven't had a chance to --

THE COURT: I am not going to ask you to object or not until you have a chance. There are four pages there that you have to read.

MR. BENBOW: Preliminarily, your Honor, it would seem to me even before our review that this does not seem the appropriate witness through which to offer this document.

MR. GRAND: This is a document that may have been prepared by the elusive Mr. Kloby, your Honor, and to play that game with me is to --

THE COURT: You offered it. Let them make up their mind as to whether they object.

MR. GRAND: All right. Thank you.

MR. BENBOW: Your Honor, I see no basis for

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counsel's assertions.

THE COURT: Skipping the assertions, what about the document that he is offering?

MR. BENBOW: I object to it, your Honor.

MR. GRAND: Would you read 63?

MR. BENBOW: I have looked at 63.

MR. GRAND: Your Honor, I think this is one of these instances where self-authentication would --

THE COURT: Let me see it.

MR. GRAND: I call your attention, your Honor, to Plaintiff's 62 and 63 in evidence as well as the document being offered.

MR. BENBOW: I don't know if it is appropriate that he should be showing this to you, your Honor.

THE COURT: Two items already in evidence?

MR. BENBOW: The two in evidence I have no objection about.

THE COURT: Why do you object to this, which is Defendant's 243?

MR. BENBOW: Its authorship has not been established, it looks to be an incomplete document on its face, and the witness has not been able to identify it in any way, your Honor.

MR. GRAND: Your Honor, it is a Singer

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document that we obtained from Singer.

THE COURT: That doesn't in and of itself --

MR. GRAND: I understand.

THE COURT: All right. Go ahead. You have given me six pages of documents. I don't do instant rulings.

MR. GRAND: I understand.

THE COURT: All right.

BY MR. GRAND:

Q Mr. Romel, was it your understanding based on youur conversation with Mr. Perrino that 600 pounds of pressure, output pressure of the Perma-Vac can, was adequate for all situations in 1964, prior to December 21st?

THE COURT: You mean the conversation occurring at that time.

A Yes.

Q And we are clear, are we not, that some time prior to December 21, 1964 you had a conversation with Mr. Perrino in which he told you that?

MR. BENBOW: Objection, your Honor. This has been covered many times.

THE COURT: I think it has been, but it might be preliminary.

MR. GRAND: It is, your Honor.

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A Yes.

Q Now will you tell me, sir, what event or events transpired between that conversation and your letter to Mr. Perrino of December 23, 1964, Plaintiff's 65A in evidence, which led you to ask Perma to investigate and recommend design changes to yield increased pressures.

A I became responsible for the design aspects of the device and I requested in the prior paragraph documented engineering data which would back up all of the specifications. I asked for backup data on both the dual and the single unit. I felt it was necessary to have this information in case any questions arose or possibly for future use if I was called upon to make decisions due to manufacturing problems and what have you.

The emphasis there is on providing data to substantiate all of these changes that had occurred during 1964. I felt it would be advisable for me to have this information, which I could use for backup material, and in the event that the information did not substantiate these specifications, I suggested that he take a look at the design, in the event that that was the case, but I didn't know.

Q Is it fair to say that as of the time you

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wrote the letter you were concerned that the operation of the Perma-Vac can or its output might be marginal?

MR. BENBOW: I object.

THE COURT: No, I will permit it.

A I was concerned about habing the development data at my disposal so that --

Q Could you answer my question.

A -- I could definitely refer to this data in case there was a problem about something that I wasn't aware.

THE COURT: The question was were you concerned that the output was marginal or might be marginal.

A I really don't know. I think the thing that I was thinking of was the decision to reduce the specification and I wanted to have backup material to really substantiate that this was a good decision to make.

Q By "backup material" you mean test data to demonstrate that 600 pounds was sufficient, correct?

A It was locking pressures on all makes or model cars, which I believed that Perma had in their possession.

Q You are not including in the term "backup data" proposed design changes, are you?

MR. BENBOW: Objection, your Honor.

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THE COURT: No, I will permit it.

A No. Backup data would preclude any design changes.

Q Now let me ask you again, when you asked him to recommend a design change was it because you believed the output of the Perma-Vac can was marginal?

MR. BENBOW: Objection, your Honor.

THE COURT: No, I will permit it. Just answer yes or no.

THE WITNESS: I don't think I can. I don't think I was sure.

Q You had some question about whether it was marginal at that point in time, isn't that true?

A I had some question about how the decision was made and I wanted to see the information that backed up the decision.

Q And you also wanted to see something else, didn't you, namely, a proposed design change?

A Only --

MR. BENBOW: Objection, your Honor.

THE COURT: No, I will permit it.

A Only in the event that the data indicated that this was necessary.

Q You mean only if the data indicated it was

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necessary would you need to adopt a design change, is that what you are saying?

MR. BENBOW: Objection, your Honor. That is contrary to the language of the document on which Mr. Grand is relying.

THE COURT: I don't think it necessarily is, Mr. Benbow, and I will permit the question.

THE WITNESS: Would you read it.

(Question read.)

MR.BENBOW: Do you still have Plaintiff's 65A before you, your Honor?

THE COURT: Yes.

MR. BENBOW: Page 2?

THE OCURT: Yes.

A To investigate --

MR. BENBOW: I still object.

A -- whether a design change was necessary.

THE COURT: It's a quarter to 5. Let's stop at this point. See you at a quarter to 10 in the morning.

MR. GRAND: Fine.

(Adjourned to May 30, 1974, at 9:45 a.m .)

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PERMA RESEARCH & DEVELOPMENT COMPANY

- v s - 66 Div. 665

THE SINGER COMPANY.

30 May 1974
9:45 a.m.

(Trial continued.)

A L B E R T E . R O M E L , resumed.

MR. GRAND: Your Honor, to the extent that I have an offer of an exhibit pending, I would like to withdraw that offer for the moment..

THE COURT: That's funny, because I was going to refuse to accept it.

MR. BENBOW: Do I understand it has been accepted or withdrawn?

THE COURT: It is withdrawn, and if it is offered, it is refused.

MR. GRAND: I would like to do some more inquiring about it.

CROSS-EXAMINATION

BY MR. GRAND: (continued)

Q Mr. Romel, did you write, compose that document, Defendant's 243 for identification?

MR. BENBOW: Do you have a copy of that?

MR. GRAND: I do not have a separate copy of that

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document.

A I don't think so.

Q It doesn't look familiar to you, is that correct?

MR. BENBOW: Objection.

THE COURT: No, I will permit it. Does it look familiar to you?

THE WITNESS: I don't remember it, no.

Q During the months of January and February 1965, Mr. Romel, who was it at Singer who requested engineering services from Perma under the technical services contract?

A I did.

Q And who was it at Singer who received such services?

A I did.

Q And did you, sir, prepare any documents reflecting services that you received?

A Not that I can remember now.

Q You did, did you not, as part of the engineering services you received under the technical services contract receive some stopping distance tests from Cadillac Motor Company?

MR. BENBOW: Objection, your Honor. I don't know that those constituted services.

MR. GRAND: I am asking the question.

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MR. BENBOW: And I am objecting.

THE COURT: I will permit it.

A Yes, there was information received.

Q By you, is that correct?

A Yes.

Q Did you advise anybody of that fact at Singer?

A Yes.

Q Did you, sir, as part of the engineering services received from Perma receive tests conducted on six different types of vehicles to determine locking pressures?

A Yes, I did.

Q And did you, sir, as part of the services rendered under the technical services contract receive field reports from Perma?

A Yes.

Q Did you also, sir, as part of such services receive Ford oscillograph tapes?

A Yes.

Q And did you record the receipt of that information anywhere and report it to anybody at The Singer Company?

A I don't remember recording it, no.

THE COURT: When you say any of that information, are you talking about all the four categories?

MR. GRAND: Yes.

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THE COURT: Do you understand that?

MR. BENBOW: Could I hear the question, your Honor?

THE COURT: Well, the question was, did you report to anyone at Singer the information which I have just asked you about, and I just want to make sure the witness knows it is all of the categories involved.

THE WITNESS: Well, he said record. I thought he said --

THE COURT: Yes, record or report.

THE WITNESS: I didn't record it, but I reported it.

Q By record, I mean record on paper.

A No, I didn't, not that I could remember.

THE COURT: Who did you report it to?

THE WITNESS: I think I gave copies of the correspondence to Kloby or he was copied. I really don't remember.

Q Did you, as part of the services that you received from Perma in January also receive a design change recommendation regarding the Perma-Vac spring?

A I'm not sure because --

Q You're not sure. That's enough of an answer for me.

THE COURT: Go ahead.

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Q All right, now, sir, let me show you a document that is designated Defendant's Proposed Exhibit No. 417. It is a memorandum dated February 16, 1965, from Mr. Kloby to Mr. Broeker. It has attached to it a document we have been talking about and the page before the attachment refers to the fact that you wrote that document.

Now, would you look at that and tell me if that refreshes your recollection?

MR. BENBOW: Can I hear that question?

(Question read.)

MR. BENBOW: May I, your Honor?

THE COURT: Don't you have a copy?

MR. BENBOW: I haven't yet. We gave Mr. Grand ours of this.

THE COURT: All right.

MR. GRAND: I haven't offered the document.

THE COURT: I understand.

A I don't remember preparing anything in writing. This statement referring to a report could have been verbally; it could have been giving him copies of the correspondence. Generally, I signed whatever correspondence that I wrote.

Q Do you recall Mr. Kloby asking you to prepare a report on the items described in 8, 9 and 10 of the

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document?

THE COURT: Pages 8, 9 and 10?

MR. GRAND: No. Items.

Q Items 8, 10 and 13, on the attachment to Defendant's 417?

A What was the question?

(Question read.)

MR. BENBOW: Objection, your Honor.

THE COURT: No, I will permit it.

A I don't remember him asking me to prepare a report. I recall discussing with him the topic of engineering services, though. I don't remember specifically what we covered.

MR. GRAND: Your Honor, I am going to offer Defendant's Proposed Exhibit 417, document marked for submission at this trial by the defense. It is a Singer document. It is a signed document with the signature presumably of Mr. Kloby.

Q Let me ask you, sir. Are you familiar with Mr. Kloby's signature?

A Yes, I probably can recognize it.

Q Tell me if that is Mr. Kloby's signature on the third page of Defendant's 417, sir.

A As best as I could recall, I guess it is.

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MR. GRAND: Good. Thank you. I will offer the document.

THE COURT: Do you object, Mr. Benbow?

MR. BENBOW: Could you just give me one moment?

THE COURT: Sure.

(Pause.)

MR. BENBOW: Your Honor, now that a covering document has been provided, which I note was Plaintiff's 37-A for identification in a deposition, apparently, in 1970, I have no objection to this document coming in.

MR. GRAND: Good.

THE COURT: Good. Mark it.

(Defendant's Exhibit D-417 received in evidence.)

Q What was the design change recommendation received by the Singer Company regarding the Perma-Vac spring that is referred to in the attachment to Defendant's 417, Mr. Romel?

A I don't know.

MR. BENBOW: Objection.

THE COURT: I will permit it.

A I don't know. I have a problem with that one because --

THE COURT: No, you don't know. That's fine.

Go ahead.

Q Do you note, sir, the statement in Item H, "This change may increase the yield pressure after vacuum."

Do you see that?

A Yes.

Q Is that statement a conclusion of yours reached by you at some point in time?

A I couldn't tell you now.

Q Did you, sir, ever look into the design change recommendations submitted by Perma?

A Let me say this: The thing that confuses me is that on March the 4th -- and there is correspondence which I wrote indicating that Mr. Perrino had admitted at that time that the spring design or the Perma-Vac design, which basically involved a spring, was marginal.

Q That is correspondence that who wrote?

A It confuses me as to what we are talking about here.

THE COURT: Did you write that?

THE WITNESS: This was a letter that I wrote to Mr. Broeker.

THE COURT: Yes, but what about this spring design change?

THE WITNESS: That's what I'm saying. This doesn't

make sense to me because we are looking at period of time of February, and here at March, Mr. Perrino and I are talking about --

THE COURT: No, no, you are writing a letter in March. It doesn't make sense to you, though. Think how difficult it is for me.

Q What about this document dated February 11th, sir? Did you look into or investigate or analyze in any way the proposed design change recommendation regarding the Perma-Vac spring that is referred to in the February 11, 1965 attachment to 417?

A I don't remember it.

Q You don't remember doing so?

A No, I say I don't remember the situation, and it still doesn't make -- I just can't correlate the timing here. It doesn't make sense.

Q You don't remember Mr. Perrino submitting a recommended spring size change, but you do recall your making a recommendation about a spring size change a few weeks later, is that correct?

MR. BENBOW: Objection, your Honor.

THE COURT: I will permit it.

A No, I don't think you are stating that correctly. What I said was that Mr. Perrino admitted on March the 4th

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that the design was marginal and that the spring had to be changed, and it just doesn't follow logically.

Q You have apparently got in your mind that Mr. Perrino made some kind of an admission to you in March; is that correct?

MR. BENBOW: Objection, your Honor. Defendant's 355 establishes that.

MR. GRAND: Oh, no, it establishes only that he wrote it.

Q Defendant's 355 in evidence makes reference to or states as follows:

"At our meeting with Mr. Perrino on March 4, 1965, he admitted that the present specifications should be higher to cover the higher pressures required due to brake fade, wear and other characteristics found in the normal brake systems. He also admitted that the present spring design is inadequate and a new spring would have to be developed to obtain high pressures."

Do you see that?

A This is what I was referring to.

Q The document does not state that that is the first time the subject was ever discussed between you, does it?

A No.

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MR. BENBOW: Objection, your Honor.

THE COURT: The document speaks for itself. On March 4th, was that the first time you ever talked about this?

THE WITNESS: No, we talked about springs earlier in the program. He always said it was adequate. What I am saying here, this is the first time he ever admitted to me that it wasn't adequate.

Q Mr. Romel, I want to show you Defendant's 400, a letter from Mr. Mainelli to you, dated January 18, 1965, with a received stamp on it. Is that your received stamp?

A Yes, it is.

Q You got that document? You received it?

MR. BENBOW: Objection. Your Honor, did you want to look at Defendant's 417?

THE COURT: No.

A Yes, I received this.

Q You will note on the second page of the document there is reference to a statement, "An explanation of the single piston and dual piston Perma-Vac regarding output hydraulic pressures design and possible design change of the piston spring is enclosed."

See that?

A Yes, I see that.

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Q Do you have any question in your mind that you received from Perma design change of the piston spring?

A Well, the thing that troubles me is the word "possible", and the fact that as late as March the 4th apparently --

Q Please try to answer my questions today. Do you have any question in your mind that you received as an enclosure to this letter, Defendant's 400 in evidence, a proposed or a possible design change of the piston spring?

MR. BENBOW: Your Honor, I object to that. It seems to me that --

THE COURT: No, the question was asked before and you didn't object then. Even if you did object, I would still permit it. Answer the question. Did you get the thing or not? Do you have any doubt in your mind that you did get it?

THE WITNESS: I have doubt because of the --

Q That's an answer.

THE COURT: All right.

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Q Did you, sir, after reading the letter and observing that you didn't have it or having doubts as to whether you received it communicate with Perma and tell them to send it to you?

MR. BENBOW: Your Honor, I object. The item says an explanation was provided. Now, it was an explanation of something. That is all that that line says.

MR. GRAND: Funny, that is ~~now~~ not how they characterized it in their subsequent documents.

THE COURT: All right. I read it. Go ahead.

Q Did you, sir, after receiving that letter telephone Mr. Mainelli or write to Mr. Mainelli and ask him where the possible design change was?

MR. BENBOW: Objection.

A The proposed design change.

THE COURT: No, I will permit it.

MR. BENBOW: Possible design change?

THE COURT: Possible design change.

A I know we had discussions about the design which were relative to the locking pressure tests over a period of time and I don't remember specifically what you are referring to here. Now, I am still troubled by --

THE COURT: No. I want to ask two ques-

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tions. Give me that last defendant's exhibit, the very last one.

MR. BENBOW: Defendant's 417?

THE COURT: No. It's 600-some-odd.

MR. BENBOW: You mean not referred to this morning?

THE COURT: Not referred to this morning.

MR. GRAND: 672, I think.

THE COURT: It's the blueprint.

Do you remember on November --

MR. BENBOW: Your Honor, here is 670. Would that be it?

THE COURT: No. Do you know on November 4 or 5, 1965, whatever it might have been, you talked to Mr. Perrino about certain changes that he was suggesting? Is that correct, sir?

THE WITNESS: Yes.

THE COURT: And by November 8th you had decided that those changes were technically not feasible, is that correct?

THE WITNESS: Yes, that's correct.

THE COURT: I am showing you Exhibit 98, the second page thereof. Would you say that the design change introduced on that page is more technical and

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difficult to visualize than the design change in the spring?

THE WITNESS: Yes, I would say so.

THE COURT: And you made up your mind about that design change without ever seeing the schematic, is that correct, sir?

THE WITNESS: Yes, that's correct.

THE COURT: Okay. Go ahead, Mr. Grand.

MR. BENBOW: That was about 10 months later, your Honor.

THE COURT: I don't care when it was.

BY MR. GRAND:

Q Did you communicate with Perma after receipt of Defendant's 400 and tell anyone at Perma that any of the enclosures had not been received by you, that is, any of the enclosures listed in Defendant's 400 had not been received by you?

A No, I don't recall doing that.

Q Does that refresh your recollection that you got the enclosures that were described in Defendant's 400?

MR. BENBOW: As described, your Honor.

THE COURT: Is that an objection?

MR. BENBOW: Yes, your Honor.

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THE COURT: Overruled.

A I really don't remember what form it took or anything else?

Q All right. Did you, sir, analyze or look into whatever it was that was submitted to you concerning the spring?

A Whatever it was, I must have, because I reviewed all the information that was received. But I just don't remember.

Q Did you draw any conclusions from your investigation or analysis of that recommended design change, proposed design change?

MR. BENBOW: Objection, your Honor. I think the design change is yet to be established and he keeps assuming that it is here. It seems to me, as I pointed out before, the language of the document does not lend itself to it and --

THE COURT: Is this a summation?

MR. BENBOW: No, your Honor.

THE COURT: What are you trying to do, tell the witness what to answer?

MR. BENBOW: No. I object.

THE COURT: If you object, you object. That is enough. I will permit the question.

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THE WITNESS: Can you read it, please.

(Question read.)

A As I told you before, I don't remember what form this took or what it was.

Q And the statement at the second sentence in item II, "This change may increase the yield pressure after vacuum," does not refresh your recollection on that subject in any way?

A No.

Q Am I correct that in order to increase the yield pressure of the Perma-Vac as it existed on February 15th by recommending a design change in the Perma-Vac spring that change would have to involve increasing the force of the spring?

A Yes, it would.

Q Do you, sir, have any recollection that Perma submitted to you a design change or a proposed design change calling for increasing the force of the spring?

MR. BENBOW: Objection, your Honor.

THE COURT: No, I will permit it.

A No, I don't.

Q Did you build any spring or obtain a spring after receiving Defendant's 400?

MR. BENBOW: Objection, your Honor.

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THE COURT: No, I will permit it.

A Over a period of time we made several different psrings, but --

Q In response to or in pursuit of the recommended or proposed or possible design change enclosed with Defendant's 400, did you do that?

MR. BROWN: Objection, your Honor, still not established.

THE COURT: No, I will permit it.

A I don't remember. I can't specifically tie any of these things that we tried, changes in the spring, with this particular instance. Not now I can't.

THE COURT: When did you try to change the spring?

The record should note the long pause.

THE WITNESS: I really can't remember. I think it was later in '65.

THE COURT: Later in '65.

THE WITNESS: Well, we obviously did when we experimented with the various alternatives later in the year, but I think there was other work being done earlier than that.

Q I gather you cannot tell us the basis for the sentence I have been reading to you in item II concerning

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the change made --

THE COURT: H of exhibit.

Q -- in the attachment to 417 to the effect that this change may increase the yield pressure after vacuum?

MR. BENBOW: Objection, your Honor.

THE COURT: No, I will permit it.

A Right now I can't, no.

Q Am I also correct that you cannot now tell us whether in January or February, 1965 any springs were obtained or built after receiving Defendant's 400 from Perma?

A That may have been, but I don't remember it now.

Q Can you tell me, sir, was the design changed in January or February, 1965?

THE COURT: Which design?

MR. GRAND: Thank you.

Q The design of the Perma-Vac spring.

MR. BENBOW: Objection, your Honor.

THE COURT: No, I will permit it.

A Not that I could recall.

Q You also cannot recall ever building or installing a spring in the Perma-Vac can of the dimensions

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or specifications or proposed design changes received from Perma in Defendant's 400, can you?

MR. BENBOW: Objection.

THE COURT: I think it has already been answered, Mr. Grand.

Q Do you have any recollection of rejecting this proposed design chang

A No.

Q It is just a blank in your mind.

MR. BENBOW: Objection.

THE COURT: He just doesn't remember. Whether you want to make it a blank or not, it doesn't matter. That is argument.

MR. GRAND: Fine.

Q Do you know, sir, if this proposal or proposed design change received from Perma involved a proposed change in the size of the can as well as the size of the spring?

A No.

Q No, you have no recollection?

A That's right.

MR. BENBOW: I object to that, your Honor.

THE COURT: What, that he has no recollection? He just said so.

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MR. GRAND: If there is any way to create one --

MR. BENBOW: I objected to the question, your Honor.

THE COURT: I will permit it.

Q At some point you recomm3nded a spring change or an increase in the spring force in the Perma-Vac to Mr. Perrino, did you not?

A Yes, that's correct.

Q When was that?

A Somewhere in March.

Q And that was in a conversation?

A Yes.

Q Did you make that recommendation to him in writing?

A No.

Q And did Mr. Perrino agree with that need or disagree with your suggestion?

A I disagreed with it because he said it was -- would require a lot of development.

Q When was that conversation?

A In March some time.

Q Was that before or after Mr. Perrino admitted to you that the spring should be changed?

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A I think it was after.

Q First Perma recommends a design change or submits one to you --

MR. BENBOW: Objection.

Q -- that is referred to in the February 11th document, nextyou recommend a design change to Mr. Perrino and he tells you it is not necessary?

A Well, I think the sequence is --

THE COURT: I don't think you have to answer the question. I sustain the objection.

Q Do we have it that after Mr. Perrino admitted that the spring should be changed he then told you that it should not be changed?

A Well --

MR. BENBOW: Objection.

MR. GRAND: I just want to make sure I understand.

THE COURT: I think you have been over it.

Q When you proposed a spring design change to Mr. Perrino what was the form of the proposal?

A This was a telephone conversation relative to the displacement problem with the LTD. During this whole period of time there were so many things happening --

Q No, no. You are really not answering my

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question.

THE COURT: One conversation on the telephone, is that what it is?

TGHE WITNESS: Yes. This was the displacement problem.

THE COURT: Okay.

Q Did you, sir, in that conversation have in mind any particular can size?

A No.

Q Did you have in mind any particular spring size?

THE COURT: I don't care what he had in mind. You want to reframe those questions?

MR. GRAND: Certainly.

Q In that conversation when you recommended a change in the spring size to Mr. Perrino did you tell him what size spring should be installed?

A No, it wasn't that easy.

Q Please. The answer is no.

A It is more complicated than that.

MR. GRAND: I don't really think it should be, your Honor, and I think I am entitled to yes or no answers here.

THE WITNESS: Itis. You just can't change

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the spring.

THE COURT: Yes, but you can answer yes or no as to whether you recommended a size and specifications of the spring.

Q Did you?

A No.

Q Did you recommend size and specification changes, that is, specific sizes and specification changes, with respect to any specific component of the unit at that time?

A No. There were other variables that you had to consider, which I did not have information on.

THE COURT: Just yes or no.

Q What I am trying to ascertain is whether you made a specific proposal to Mr. Perrino.

THE COURT: And the answer so far is no. Go on to the next question.

Q Did you recommend a specific bore size to Mr. Perrino?

THE COURT: When?

Q During this conversation.

A No. He recommended one.

Q Did you recommend a can size to Mr. Perrino?

MR. BENDOW: Your Honor, I think the wit-

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ness was answering.

THE COURT: He can answer the question yes or no.

Go ahead, ask the next question.

MR. GRAND: I had a question, whether he recommended a specific can size. I did not get an answer.

A No.

Q And you did not recommend a specific spring size.

A That's correct.

Q And you did not recommend a specific spring composition?

A No, I didn't.

Q Approximately a week or so after that conversation did Mr. Perrino tell you he had designed a transfer valve?

A Yes, that's correct.

Q And the transfer valve that he had designed had parts of a particular size and strength, did it not?

MR. BENBOW: Objection, your Honor.

THE COURT: No, I will permit it.

Let's use the technical word. Were there specifications involved with the design as to the various

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parts?

THE WITNESS: There were no -- when he came down to Elizabeth he had no specifications; all he had was the model.

Q He had hardware, didn't he?

A Yes.

Q Before he came down had you developed any hardware to increase the spring force of the Perma-Vac? Had you built anything?

A I don't remember. We might have. I really don't recall.

Q Can you tell me what size and shape it would have been if you had built it?

MR. BENBOW: Objection, your Honor.

THE COURT: I sustain the objection.

A Shape of what?

Q The spring.

THE COURT: No, no. He doesn't remember. How can he tell you what size and shape.

Q Was it after the transfer valve was designed and built that Mr. Perrino then said to you or recommended to you that Singer go ahead with the transfer valve rather than commence working on changing the spring size.

MR. BENBOW: Objection, your Honor.

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THE COURT: No, I will permit it.

A He --

Q Can you answer that.

A Yes, he said it was a solution to both the short-term and long-term problems of pressure and displacement.

Q In other words, after you already had a model of the transfer valve you recommended to MR. Perrino for the first time a change in the spring size?

MR. BENBOW: Objection.

THE COURT: No, no. That is not what he testified to at all.

MR. GRAND: May I have it read back? That is what I heard.

THE COURT: Go ahead, read it.

(Record read.)

Q And it was at that point that you recommended a spring size change?

MR. BENBOW: Objection.

THE COURT: Was it at that point?

A Well, when you say designed and built you are talking about at Perma, right?

Q Wherever. I don't care where it was designed and built.

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A I explained and gave testimony of a series of telephone conversations with Frank Perrino. We had these discussions over the phone. He came back in a week and told me he had the solution to the problem.

MR. GRAND: I don't think I am getting an answer to my question, your Honor.

THE COURT: Are you moving to strike the answer?

MR. GRAND: I am.

THE COURT: Strike it.

Now let's go back to the question that was asked you and answer that one, if you can. If you can't answer it, say you can't answer it.

THE WITNESS: What was the question?

(Question read.)

MR. BENBOW: Your Honor, I would like to point out, if I understood the rereading of the record correctly, in reading it back the reporter read the question, omitted the colloquy in between, where Mr. Grand said, "Can you answer my question?" and then the answer was read, and I don't think we should be misled as to the state of the record by that omission.

THE COURT: Mr. Benbow, the witness asked solely for the question or somebody asked solely for the

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question. That's all the reporter read. The reporter was doing his job properly.

MR. BENBOW: Of course.

THE COURT: He is not trying to mislead anybody. I suggest you just relax about such things.

My recollection is I asked for the question to be read.

MR. BENBOW: You did, your Honor.

THE COURT: All I am asking for now is an answer from Mr. Romel.

MR. BENBOW: Fine, your Honor.

THE WITNESS: The way I think I understood --

THE COURT: Can you answer it, yes or no.

THE WITNESS: He said after I had the model and if I understand the question correctly the answer would be no, it was before.

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Q Before you had the model you recommended a spring change, is that correct?

A Yes.

Q But the recommendation by you of the spring change was after Mr. Perrino had told you he had designed and built a model of the transfer valve, was it not?

A I don't really see it that way, no.

Q Let me show you your testimony at Page 5104 and 5105, and ask you if that refreshes your recollection on the subject?

A Well, there could have been more than one conversation, too.

Q I don't want you to speculate about what could have been, Mr. Romel.

A Let me --

Q The testimony you gave -- just a minute.

THE COURT: The question before you was, does it refresh your recollection? The answer should be either yes or no. Does it?

THE WITNESS: No.

THE COURT: No, it does not. Okay.

Q Do you recall, sir, testifying here that in the same conversation in which you suggested the spring size change to Mr. Perrino, Mr. Perrino said, "This would

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only delay the program because the spring had been developed with a great deal of time and effort in developing the right combination of spring and can size and that with the introduction of the transfer valve, he said this would take care of the immediate problem and also take care of the problem of future disc brakes."

Do you recall giving that testimony in this courtroom?

MR. BENBOW: I object, your Honor. It is partial. It doesn't reflect the full two pages.

THE COURT: He had a chance to read the full two pages. Go ahead, answer it.

A Yes, I recall saying that.

Q And that was in the same conversation, was it not?

A There was more than one conversation. You are talking about a period ten years ago.

Q I am talking about your testimony that you gave in response to a question by Mr. Benbow, Mr. Romel.

A Well, let me explain. There were more than one conversation. One conversation I complained about the vacuum loss reducing the pressure. There were many discussions about what should or should not be done in regards to solving both displacement and pressure problems.

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Q Okay, are you done?

A Yes.

Q All right, now, I want to bring you back to Page 5104 of the transcript, when you were asked by Mr. Benbow:

"Mr. Romel, during the last session you testified about enlarging the Perma-Vac can. In March of 1965 did you have a conversation with Mr. Perrino with regard to enlarging the Perma-Vac can?

"A. Yes, I did.

"Q. When did this conversation take place, if you recall?

"A. This was just prior to the introduction of the transfer valve. The conversation consisted of my --

"Q. What did you say to Mr. Perrino and what did Mr. Perrino say to you at this time on the topic of enlarging the Perma-Vac can?"

And then you answered that.

Do you see that?

A Yes, I see it. I don't have any problem with it.

Q All right. Now, my question is, was it not in one and the same conversation that you recommended the design change to Mr. Perrino and Mr. Perrino said it wasn't necessary because the introduction of the transfer

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valve would solve the problem?

A I think it was more than one conversation.

Q So when you testified as I have indicated at 5104 and 5105, there was something in error about that testimony; is that your testimony now?

MR. BENBOW: I object, your Honor.

A No.

MR. BENBOW: The question, as Mr. Grand has just read it --

THE COURT: He just answered no. I don't need everybody to read the testimony to me.

Q Is it your testimony, sir, that when you testified at Pages 5104 and 5105 of the transcript, and I put it in front of you, you were referring to more than one conversation?

A In remembering that far back, it could have been a combination of more than one, but I think both conversations around that period of time centered on the same subject, and I am sure that we talked about the same things on these occasions.

Now, the testimony is the best that I can recall, and I think it is accurate.

Q Will you tell me, sir, whether according to your best recollection Mr. Perrino had already designed

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the transfer valve at the time that you recommended a spring change to him?

MR. BENBOW: I object, your Honor.

THE COURT: I will permit it.

A During one conversation I would say yes . I am not too sure about the -- I doubt if he did on the first conversation where he recommended just changing the bore size.

MR. GRAND: Your Honor, I have a request to call my office urgently.

THE COURT: Urgently?

MR. GRAND: It says, "Urgent that you call Mr. Feldman."

THE COURT: We will take a break.

(Recess.)

BY MR. GRAND:

Q At the time the transfer valve models were brought down to Elizabethport by Mr. -- who brought them down?

A Mr. Perrino.

Q -- by Mr. Perrino, am I correct that you and others at Singer had not redesigned the Perma-Vac can to include a larger, more forceful spring?

MR. BENBOW: Objection, your Honor.

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THE COURT: No, I will permit it.

A I'm not sure. There was --

Q You're not sure?

A No. There was some work being done.

Q When was that work being done, sir, and what work are you referring to?

A I recall trying some springs, a beehive spring or something else.

Q And you recall that now, do you?

A I don't know exactly when.

Q Do you recall that now, sir, because your recollection was refreshed during this recess by counsel in that back room?

A No.

MR. BENBOW: I object to that, your Honor.

Q You say no?

A No.

Q Did you, sir, in the last twenty minutes discuss that subject with either Mr. Lagemann or Mr. Benbow?

A No.

Q You swear to that?

A Yes.

THE COURT: He is under oath.

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Q Did you, sir, in the last twenty minutes read any testimony that you gave in this trial on that subject; yes or no?

A No. I read some related to the conversation concerning the LTD.

Q And that refreshed your recollection?

MR. BENBOW: Objection, your Honor.

A No.

THE COURT: I will permit it. Go ahead.

Q Well, when did you conduct these tests on the beehive spring, sir?

MR. BENBOW: Objection, your Honor.

THE COURT: No, I will permit it.

A I don't know. I can't recall.

Q No recollection?

MR. BENBOW: Objection.

THE COURT: If he has got no recollection, he has no recollection.

MR. GRAND: I don't have an answer. I don't know if he has no recollection when he performed these tests or some or it is vague.

THE COURT: You have no recollection?

THE WITNESS: No, your Honor.

THE COURT: All right.

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Q Was it after your trip to Detroit?

MR. BENBOW: Objection.

THE COURT: I will permit it.

A I'm not sure. I don't recall exactly when.

Q Was it after you changed the specification for the Perma-Vac output?

MR. BENBOW: Objection, your Honor.

THE COURT: I will permit it.

A I'm not sure. It could have been. I'm really not sure.

Q Did you testify in this courtroom that it was after you changed the specification?

MR. BENBOW: Objection. Do you have a page, Mr. Grand?

MR. GRAND: Right now I want to see if he has any recollection.

THE COURT: No, no, just answer the question.

A No, I don't recall.

Q Do you remember being asked at Page 4673:

"Did you work on the Perma-Vac spring design after the specification was changed from 600 to 800 psi?

"A. Yes.

"Q. What did you do with respect to the Perma-Vac springs?

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"A. We designed several springs," and then your answer goes on.

Do you see that testimony there?

A Yes.

Q Does that refresh your recollection that it was after you changed the specification from 600 to 800 psi?

A Yes, it does.

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Q When did you first see a model of the transfer valve?

A It had to be in March.

Q You testified a few minutes ago about some springs that you tested. Can you tell us what kind of tests you conducted on those springs ?

A Well, it would have been assembling them in a Perma-Vac and checking the output pressure.

Q Can you tell me what kind of springs those were?

A Well, one I recall would be of a beehive spring type. The other springs were conventionally wound.

Q Did you build the springs at Singer?

A No.

Q Were they built at Perma?

A No.

Q Were they built at Permaby Mr. Mainelli?

A No, I don't believe so.

Q Were they sent to you by Mr. Mainelli?

A I don't recall if they were.

Q Were they tested by Perma?

A I don't recall them doing that.

Q Do you recall who at Singer built them?

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I believe.

THE COURT: At any time did Mr. Broeker say anything about that.

A Well, at one time I think he said we should concentrate on trying to use as much inventory as possible, but not to let that restrict any major solution to the problem.

Q There was a serious disadvantage to utilizing the transfer valve, was there not?

MR. BENROW: Objection.

THE COURT: I will permit it.

A Yes. I discussed this disadvantage with Mr. Perrino.

Q Did you discuss it with the management of the Singer Company?

A Yes.

Q And that disadvantage was that it converted what had been a nonvacuum-dependent anti-skid device to a vacuum-dependent one, is that not correct?

A Yes, that's correct.

Q Some months later, that is, approximately six to eight months after March of 1965, there were attempts made by the Singer Company to overcome that disadvantage, were there not?

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Q I am restricting myself at this moment to the enlarged can, not the double diaphragm. You may be referring to both.

A Yes, I understand that. I thought there was more than one, but it is kind of vague.

Q Now, was the radius of the original can, the diaphragm in the original can that you have before you approximately two and a quarter inches?

MR. BENBOW: Objection, your Honor.

THE COURT: Couldn't we just measure it? Could we have a stipulation it is two and a quarter inches?

MR. BENBOW: Can we get a print?

THE COURT: Do you have a ruler?

(Pause.)

THE WITNESS: That reads four and a quarter. That would give you two and an eighth radius.

THE COURT: It looks like two and an eighth.

MR. GRAND: Maybe I can do it another way.

Q Let me show you a document that I guess we just got from defense counsel--

THE COURT: What is it?

Q Can you tell me what it is?

MR. BENBOW: Shall we mark it, your Honor?

MR. GRAND: Oh, we will.

A It is the blueprint drawing made by Swank & Company in Attleboro, Massachusetts. It is dated 5/14/63. It is a print of the Perma-Vac can.

Q Can you tell me what the radius of the diaphragm as depicted on that document is?

THE COURT: Do you want to mark it and offer it?

MR. GRAND: I will, your Honor.

A The inside diameter of the can was nominally four and a half inches, roughly, so the radius would be two and a quarter inches.

MR. BENBOW: Your measurement was good, your Honor.

MR. GRAND: Can we mark this?

(Plaintiff's Exhibit 148 marked for identification.)

THE COURT: Do you object to it, Mr. Benbow?

MR. BENBOW: Let me just look at it again, your Honor.

THE COURT: Sure.

MR. GRAND: I gather that this is one of the drawings that comes out of the --

THE COURT: I don't care where it came out of.

MR. GRAND: -- the file cabinets.

THE COURT: I don't care where it came out of.

MR. BENBOW. We have no objection, your Honor.

THE COURT: All right. Mark it in evidence.

(Plaintiff's Exhibit 148 received in evidence.)

MR. BENBOW: I would, however, like to get a copy of the original.

THE COURT: You will have an opportunity to make a copy.

BY MR. GRAND:

Q I am showing you now Defendant's 670 in evidence. The diameter or the inside diameter of the can or the diameter of the diaphragm in that design was what?

A Nine and a quarter inches, roughly.

Q That's the diameter?

A Inside diameter, yes.

Q That's the equivalent of what you said was approximately four and a half inches on the original Perma-Vac can?

A Yes.

Q Would the effect of that increase in size, again, approximately, be to quadruple the area of the diaphragm?

MR. BENBOW: Objection, your Honor.

THE COURT: I will permit it. Can you do it in

your head?

THE WITNESS: No.

Q I am talking about roughly.

A Well, it's Pi d squared over 2, so it's really -- it's affected the square of the diameter, so I don't -- off the top of my head, I couldn't calculate it.

Q Why don't you just tell us in rough terms what the relationship is between the areas of the two pistons?

MR. BENBOW: Objection, your Honor.

Q I'm sorry, I didn't give you a pencil.

THE COURT: Overruled.

A You said four and a half inches, right?

Q Yes. Since I am asking you to compare two, I don't think you need to use Pi in your equation.

A Well --

Q Do it your way. I'm sorry.

(Pause.)

Q Can you tell me how much the area on the new diaphragm has been increased over the area on the old diaphragm, Mr. Romel?

A No. I think I made a mistake here.

Q Well, perhaps we can do it more simply and in approximate terms.

I think I can dispense with the need for the

arithmetic, Mr. Romel.

You have roughly increased the diameter by a factor of two, have you not?

A It's something less than that, yes.

Q But in that range. Would that not increase the area by a factor of something in the range of four?

A Yes, if that were the case.

Q So that in rough or approximate terms --

A Actually, it's less than that, because, you see, it's Pi d -- it's really half -- it's the square of the half of the difference, so it's not a factor of four. I think it's a factor of approximately two.

Q Can you tell me, sir, how you would compute -- let's do it differently --

A I think we ought to do it the other way.

Q How do you compute the variable area on the old?

A It's Pi d over 2 square -- Pi r square.

Q Pi r square.

A Yes.

Q What do you get, Pi r squared on a radius of approximately, what was it, two and a quarter?

A Two and a quarter.

Q Fine. What's that number?

Let me suggest something, why don't you just eliminate the Pi, square the radius and compare the square of the radius of one with the square of the radius of the other?

A That's what I'm doing.

Q So what's the radius squared when the radius is two and a quarter?

THE COURT: Is this exercise really necessary?

MR. GRAND: It is a step, but I think it is also useful for another purpose, your Honor.

(Pause.)

A It doesn't figure. That comes out five to one.

Q Five to one.

A The square of the radii come out roughly five to one which --

Q What's the square of the two and a quarter?

A Well, something a little over four.

Q I think you are being a little bit unfair to yourself. It is six one-sixteenths, right, and that is something over four and under five.

A Yes.

Q Okay.

A Let's try this one.

Q And the square of -- what was it, five?

A Five and five-eighths it would be.

Q No, wasn't it five and a quarter? I just don't remember. No, it was four --

A Okay.

THE COURT: It was 9.2, 4.6.

Q 4.6. You come out to what?

A It's 11.1.

Q The square of 4 is 16; the square of 4 plus can't be 11.

A It's 21.

Q Pardon me?

A 21 point something.

Q And so you have got a relationship of 21 point something to something between four and five?

A Right.

Q And that is the relationship of something between four and five to one; is that about right?

A On the area.

Q So, to come back, and again using only the roughest approximations, you have increased the area of the diaphragm in the neighborhood of four times, okay?

A Okay.

Q All right. Was a can actually built that had the area of the diaphragm in the neighborhood of four

times that of the original diaphragm?

A Possibly. I would say yes.

Q Did you supervise its construction?

A It was made outside, I believe.

Q By some outside vendor?

A Yes.

Q And how many were made?

A I don't know. There probably was more than one. There was only one of a particular size.

Q Of the particular size we have been talking about, as represented by Defendant's 670?

A Yes, I would say so.

Q Did you order them?

A I had them ordered, yes.

Q Can you tell me what the size of the vacuum delivery -- I call it a tube -- what do you call it, this elbow-shaped --

A Elbow. It's a tube.

Q Can you tell me what the size of the vacuum delivery tube was on the original Perma-Vac? Was it approximately half an inch? I think we went through this once on voir dire.

A Either that or three-eighths, I don't remember.

MR. BENBOW: Can we get a print, your Honor?

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THE COURT: He has got a ruler right there.

A The inside diameter is just a little bit larger than three-eighths.

Q And the opening -- what is this part of Exhibit 2 called that I am pointing to, the back of the can?

THE COURT: Why don't you call it the back of the can?

A The rear wall of the can.

Q Is there a specification on Plaintiff's 148 for the size of the hole on the rear wall of the can?

A That's a half inch.

Q And is there a specification on Defendant's 670 for the size of the hole in the rear wall of the can?

A It's five-eighths.

Q Now, was the can that was built built with the tube to fit into a five-eighths inch hole, that is, the can based on the specifications contained in Defendant's 670?

A I don't know. It could have been welded on the outside diameter rather than fitted in. I'd have to -- I couldn't be sure right now.

Q How was the five-eighths inch hole arrived at?

A I could only assume that it was calculated at this point unless --

Q You can only assume?

A Yes.

THE COURT: You don't remember actually, do you?

THE WITNESS: All I remember is somebody was assigned to do this.

THE COURT: Okay.

Q You did not perform those calculations?

A No, I don't believe I did.

Q Was a can based on Defendant's 670 tested?

A Yes, I believe so.

Q And in what way was it tested?

A I think it was tested both on a test stand and in a vehicle.

Q On the test stand was it hooked up to a sensing unit, if you know?

A I don't know.

Q On the vehicle I assume it was hooked up to a sensing unit?

A Yes, it would have to be.

Q And the tubes were run from the elbow portion of the Perma-Vac through or to the sensing unit and out of the sensing unit to the manifold?

A Yes, that's correct.

Q Can you tell me what the size of those tubes were?

A No.

Q Can you tell me what the configurations were of the sensing unit that was used to test this can we have been talking about?

A I couldn't be positive because there was other work being done on the sensing unit at that time, opening up all the port sizes and things of that nature.

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Q Am I correct that when the can was tested in an automobile its performance proved to be sluggish?

A Yes, as best I can recall, that's true.

Q Thereafter there were some attempts to overcome that sluggishness, is that correct?

A Well, there were -- yes, there were, but I think --

Q All right.

A I don't remember the sizes that were used initially, but there were additional attempts. We worked on it until we had exhausted whatever ideas that we had.

Q Can you tell me, sir, what the size of the ports on the sensing unit were when the size of the hole in the back plate of the Perma-Vac was a half-inch hole?

THE COURT: Do you have any specs around of this?

MR. BENBOW: Objection, your Honor.

A Something less than 3/8ths of an inch. It looks like almost 5/16ths.

Q They were approximately the same as the size of the tube used on the Perma-Vac represented in Plaintiff's Exhibit 2, were they not?

A No, they are smaller.

Q Even smaller?

A Yes.

Q Can you tell me, sir, if those same size openings were utilized in the testing of the can based on Defendant's 670?

MR. BENBOW: Objection, your Honor.

THE COURT: Read it back.

A I don't believe they were.

THE COURT: I will permit it.

Q What size were those holes, that is, the holes in the delivery ports and the sensing unit, at the time the can whose specifications appear in Defendant's 670 was tested on an automobile?

A I don't know. I don't remember. I presume they were at least 5/8ths of an inch.

Q But you don't know that, do you, sir?

A You asked mewhat the size was and I don't recall exactly.

Q You are saying you don't know and you are presuming and I am only asking to make sure that we are clear that you don't know.

MR. BENBOW: Objection, your Honor.

THE COURT: Yes, that's clear.

MR. GRAND: All right.

Q Now, sir, can you tell me what size the opening in the back of the Perma-Vac can as depicted on Defendant's 670 should have been if the relationship of the size of that hole to the diaphragm of the diameter was to have been maintained in the same proportion as it was on the original Perma-Vac?

MR. BENBOW: Objection, your Honor.

THE COURT: I will permit it. Can you do it here?

A It should have been -- you said the Perma-Vac, didn't you, or the sensing unit?

Q The Perma-Bac.

A 3/8ths, that's 12/8ths of an inch.

MR. BENBOW: Your Honor, I am not sure the witness heard the question. Can we have it reread?

THE COURT: I am sure he did. He is working on it right now.

A I can't tell you whether it should have been, but if you want the proportion, it is 1-1/2 inches as compared with the 3/8th inches, based on the calculations that you made here before, presuming that you need to increase it by four to one.

Q In order to maintain the same proportion are you saying that the diameter should have been increased

to something over one inch.

MR. BENBOW: Objection.

THE COURT: That's what he said. I don't know what you want more.

Q To your knowledge, sir, was the diameter of the whole in the can based on Defendant's 670 ever increased to over one inch?

MR. BENBOW: Objection, your Honor.

THE COURT: No, if he knows.

A No, I doubt it.

Q Did you arrive at aconclusion as to the cause of the sluggishness of the unit or the can that was based on Defendant's 670?

MR.BENBOW: Objection.

THE COURT: No, I will permit it.

A Yes, I believe we did.

Q Was that conclusion based on the speed of the vacuum delivery?

MR. BENBOW: Objection.

THE COURT: Overruled.

A Yes, I believe it was.

Q The speed of that vacuum delivery can be affected, can it not, by the size of the vacuum ports?

A It can also be affected by the distance --

"The Court: Okay."

You remember that exchange with the court?

THE WITNESS: Yes.

A Yes, I remember it now.

Q Does that refresh your recollection that the size of the hole in the back of the can was not increased beyond 5/8ths?

A I am really not sure.

Q Is it not a fact, sir, that in order to get the benefit of increasing the size of the hoses in the manifold and in the sensing unit that you also have to do the same thing in the Perma-Vac can?

MR. BENBOW: Objection.

THE COURT: No, I will permit it.

A Yes.

Q You concluded, did you not, sir, that the sliding arrangement diaphragm in the Perma-Bac made the larger size can unworkable, did you not?

A Yes.

Q And you drew that conclusion, did you not, without increasing the size of the opening in the back of the can to the same extent that you had increased the size of the openings in the sensing unit and at the manifold?

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Q At the time the restrictor valve was first utilized you were looking for solutions, were you not, to the longer stopping distances that were being encountered on the unit with the transfer valve?

MR. BENBOW: Objection.

THE COURT: No, I will permit it.

A Yes, that's correct.

Q And am I correct that at that time you were considering approximately ten alternate solutions to that longer stopping distance problem?

MR. BENBOW: Objection.

THE COURT: No, I will permit it. Ten alternate solutions? Was that testified to here?

MR. GRAND: That is reflected, sir, on Page 3 of his report, Defendant's 577, (a) through (j), if I'm right in my counting.

THE COURT: Were you?

THE WITNESS: There were other solutions being analyzed and reviewed and so forth, yes.

Q And those solutions were divided up into short term and long term alternatives, is that correct?

A Yes, I believe they were.

Q And is it also correct that due to the cost and limited personnel available to you, you explored the

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THE WITNESS: The long term solutions --

Q I'm talking about the short term solutions.

MR. BENBOW: Objection.

Q Perhaps you had better look at the paragraph at the bottom of Page 3 of Defendant's 577 and see if that refreshes your recollection on the subject.

A Well, like I said, the long range programs entailed an area of basically high risk and unknowns. We didn't really know what we were going to get into. This would be departing completely from basic concepts here.

Q Do you have in mind what my question was?

MR. BENBOW: He responded, your Honor.

MR. GRAND: Oh, he responded, but not to the question.

MR. BENBOW: He responded to the question.

THE COURT: This document was prepared by you, was it?

THE WITNESS: Yes, it was.

THE COURT: Did you author the statement, "Due to the cost and limited personnel available, it was decided to restrict extensive experimentation to short range projects"? Is that correct, you authored it?

THE WITNESS: Yes, but I think it needs an

explanation because --

THE COURT: But did you say that at the time?

THE WITNESS: At the time I wrote this, yes.

THE COURT: Okay.

Q And at the time you wrote it you were trying to tell the truth as you saw it, were you not?

MR. BENBOW: Objection.

THE COURT: No, I will permit it. Go ahead.

A Yes.

Q Now, the restrictor valve was one of the short range solutions, was it not?

A Yes, it was.

Q And was that one selected because it appeared to you to be the least costly and had the shortest lead time and reduced stopping distances during preliminary testing?

MR. BENBOW: Objection.

THE COURT: I will permit it.

A Yes, I think the preliminary indications were that it showed the most promise from all of the alternatives that were being considered.

Q And it also appeared to you be the cheapest and have the shortest lead time, didn't it?

MR. BENBOW: Objection.

THE COURT: No, go ahead, answer it.

A If that's what I stated in the report, it probably did at that time.

Q That is what you stated in the report, isn't it, Page 4, second paragraph?

MR. BENBOW: I don't see the word "cheapest" there, your Honor.

MR. GRAND: No, I think it says "least costly." Yes, forgive me.

THE WITNESS: Have you got a question?

MR. GRAND: I have no question.

THE COURT: He has no question now.

It is time for lunch. Be back at quarter after.

(Luncheon adjournment.)

AFTERNOON SESSION

(1:15 P.M.)

A L B E R T E . R O M E L , resumed.

CROSS-EXAMINATION (continued)

BY MR. GRAND:

Q Who first raised a question as to the possible adverse effect of the restrictor valve on low co-efficient of friction surfaces?

A I don't know for sure.

Q When did it first occur to you that there might be a problem caused by the restrictor valve or the use of a restrictor valve on low co-efficient of friction surfaces?

A I thought it might be a problem when first thinking about the idea but --

Q That is back in May of 1965?

A Yes, I think I had a suspicion, or I thought in those terms.

Q And what did you do at that point to confirm or allay your suspicion?

A Well, we tried some test runs on a soaped road surface.

Q In May?

A This was prior to going out to 287, somewhere in

that period.

Q And you went out to 287 sometime in June, did you not?

A Might have been the end of May. I'm not really sure.

Q All right. Now, what did you do to test the effect of the restrictor valve at this point in time you are talking about with soaping the road?

MR. BENBOW: Objection.

THE COURT: No, I will permit it. Go ahead.

A The road surface was wet down and soaped and we ran a series of stops, as I recall.

Q What happened?

A There was sort of mixed results.

Q What was the mixture?

A I think there were maybe one or more instances where the unit --

Q I can't hear you, and I am very close.

A I'm sorry. As I recall, there was one or two instances of the unit not pumping. There were others where it did pump.

Q Did you say there were one or two instances where it did not pump and there were others where it did pump?

A Yes. I don't recall exactly the sizes and so forth.

Q Did the surface on which you conducted these tests remain sufficiently slick through the tests so that you were satisfied you had tested the effect of a restrictor valve on a low co-efficient of friction surface?

A No. We had problems in that regard. It kept drying up; very hard to control.

Q Can you tell me physically how you did it?

A I think it was liquid soap that was used on wetted surfaces.

Q Perhaps we had better get that clarified. Did someone spread the liquid soap on the surface?

A Yes. It was continually spread and wetted down.

Q But even so, it did not stay slick throughout the tests?

A No. As I recall, I think we had a lot of problems in that respect.

Q At its slickest, what effect did the restrictor valve have on the operation of the unit?

MR. BENBOW: Objection, your Honor.

THE COURT: I will permit it. Go ahead.

A I don't think I could really recall specifically.

Q When the surface was at its slickest, did the

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A Yes, it does.

Q And that document is dated June 4th, is that correct?

A Yes. This refers to a Cadillac test, though.

(Pause.)

THE COURT: Why don't you let it go for now, Mr. Grand?

MR. GRAND: I think I have got it now, your Honor.

Q At Page 4819, sir, you testified:

"Q. Just to try to clarify this a bit, Mr. Romel, when you testified that prior to the Route 80 testing you did not do tests at high speeds or low co-efficient of friction surfaces, what were you referring to as low co-efficient of friction surfaces?

"A. I was referring to a condition of snow or ice. The soap test was inadequate in that it kept drying up and did not in my opinion represent very low co-efficient of friction surfaces."

Now, sir, when did you conduct a test, if at all, on a surface that did, in your opinion, represent a very low co-efficient of friction surface?

A I didn't.

Q You didn't?

A No.

Q Even though you were suspicious of the effect of a very low co-efficient of friction surface on the unit when equipped with a restrictor valve?

MR. BENBOW: Objection.

THE COURT: Sustained. He has already testified to that.

Q What were you trying to achieve by the use of the restrictor valve, Mr. Romel?

MR. BENBOW: Objection. I think that was covered this morning, your Honor.

THE COURT: I will let him do it again. I assume it is preliminary to something.

MR. GRAND: It is.

A I was testing out the theory that reducing the free wheeling portion of the cycle would result in shorter stopping distances.

Q Was there any pressure that you were seeking to keep the pressure above?

MR. BENBOW: Objection.

THE COURT: No, I will permit it.

A No. The idea was to change the rate of drop so that the governor would start spinning up sooner and return the braking quicker. This was the theory behind

this concept.

Q Was there any particular pressure at which you were trying to cause the governor to be re-applied or the brakes to be re-applied at?

A Well, the idea would have been theoretically to have immediately re-applied. I think this is why we were doing the experimentation, to determine what all of the effects would be and how much merit there was in taking this approach or some other approach which would result in the same effect, and that being to decrease the amplitude of the pressure pulsations.

Q And am I correct that you did not try to arrive at answers to these questions mathematically?

MR. BENBOW: Objection.

THE COURT: No, I will permit it. Go ahead.

A At that particular time, I think, it would be very difficult if not impossible to do that.

Q For you, sir?

A Yes, I would say so.

Q Now, can you tell me over how long a period of time, how many months did Singer engage in testing the effects of various sized restrictor valves on either high co-efficient of friction surfaces or wet surfaces, as opposed to very low co-efficient of friction surfaces?

MR. BENBOW: Objection, your Honor.

THE COURT: Do you want to throw in the soaped ones, too?

MR. GRAND: We have got the answer to soaped ones.

THE COURT: Okay. I will permit it. Go ahead.

A Can you read that?

Q Maybe I can make it more simpler. I think it would help.

During how many months did you conduct tests on the effect of the restrictor valve?

MR. BENBOW: Objection.

THE COURT: I will permit it. Go ahead.

A Approximately two, I would guess.

Q During the months of June and July?

A Yes, that's about correct.

Q And some of those tests are represented by appendices to Defendant's 577, aren't they?

THE COURT: Show them to him.

A Yes.

MR. GRAND: He has answered the question.

Q Did road testing of units equipped with the restrictor valve continue into the Fall of 1965, Mr. Romel?

A Possibly. I'm not really sure.

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Q In addition to road tests, there were certain laboratory tests conducted over a period of months, were there not?

A Yes, there were.

Q At least some of those tests are represented by Defendant's 323 in evidence, is that not correct? That is the document entitled, "Effect of low Temperature on Metering Valves."

A Yes.

Q Those tests took place in August, September of 1965, did they not?

A Yes, that's correct.

Q As a result of those tests, did you conclude that the restrictor valve would have an adverse effect on the operation of the unit at zero degrees Fahrenheit on snow?

MR. BENBOW: Objection.

THE COURT: No, I will permit it.

A I don't know about the zero degrees, but I think Mr. Urban's report would reflect his opinion that there would be some difficulty at very low temperatures.

Q Do you know, sir, or can you tell us whether Mr. Urban was working full time on testing the effects of low temperature on the metering valves?

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MR. BENBOW: 98 is I believe the one he received, your Honor. So I think that is the most appropriate to put before him?

MR. GRAND: Fine, good.

THE COURT: Okay.

Q Do I understand that on November 4, 1965 you had a telephone conversation with Mr. Perrino?

A Yes, that's correct.

Q And in that conversation Mr. Perrino told you about the fail-safe feature or fail-safe modification to the transfer valve?

A Yes, he did.

Q And he also told you about the modification of the piston for higher pressures?

A Yes, he did.

Q And he also told you about the vacuum-sensitive fail-safe switch that would electrically move the solenoid?

A Yes.

Q After your conversation with Mr. Perrino you had a conversation on that same day with Mr. Person, is that correct?

A Yes, that's correct.

Q And you told him of your conversation with

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Mr. Perrino?

A Yes.

Q But you did not in your conversation with Mr. Person tell him about the vacuum-sensitive switch that operates the solenoid, did you?

A I may have. I don't recall it though.

Q If it will assist you, when you testified on direct examination you did not include that in the conversation you described with Mr. Person. See if that refreshes your recollection.

A Yes, I remember the testimony.

Q Good. So I am correct then, am I not, that you did not discuss with Mr. Person the vacuum-sensitive fail-safe switch that affects the solenoid?

MR. BENBOW: Objection. He has already testified, your Honor, "I may have."

THE COURT: Yes, and then he indicated that he was standing by his testimony which indicated that he did not. Which is it going to be?

A I don't remember. I really don't recall.

Q You had a further telephone conversation with Mr. Person on November 9th, did you not?

A Yes.

Q And in that conversation you discussed with

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Mr. Person the piston modification, is that correct?

A Yes.

Q And you discussed the transfer valve fail-safe?

A Yes.

Q And once again you did not discuss the vacuum-sensitive fail-safe that affected the solenoid, did you?

MR. BENBOW: Objection.

THE COURT: Overruled. Go ahead.

A I am not sure. This was --

Q I think that's an answer.

THE COURT: Go ahead.

Q I believe you have testified that you undertook an analysis of the effect of the fail-safe modification to the transfer valve.

A Yes.

Q And that analysis is in writing, is it not?

A Yes.

Q And it is in evidence here?

THE COURT: Is it in writing?

THE WITNESS: Yes.

THE COURT: All right. Is it marked in evidence?

MR. GRAND: It is.

MR. BENBOW: It is, your Honor.

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THE COURT: All right,- fine.

Q Did you, sir, at any time do a written analysis of the effect of the fail-safe modification which is the vacuum-sensitive switch that operates the solenoid?

A No. Perrino said to disregard this unless a fail-safe for the fail-safe was required.

Q I see. Wasn't this some six months after you stopped relying on Mr. Perrino.

MR. BENBOW: Objection, your Honor.

THE COURT: Sustained.

Q In any event, Mr. Perrino said to disregard it unless a fail-safe was required and you disregarded it, is that correct?

MR. BENBOW: Objection.

A It did not do the job anyway.

Q Did you or did you not disregard it?

MR. BENBOW: Objection.

THE COURT: No, I will permit it.

A It doesn't do anything.

Q Will you answer my question, sir.

A It was not included in the written analysis.

Q Fine. And Mr. Perrino told you to disregard it, correct?

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Q Just the three of you?

A As far as I can recall, yes.

Q And you didn't go beyond the three of you for help when you were unable to arrive at the theory and design specifications?

MR. BENBOW: Objection, your Honor.

THE COURT: I think that's argumentative. He said that there were only three people involved.

MR. GRAND: All right.

Q You drew certain conclusions or came to certain conclusions about the feasibility of such a valve, did you not?

MR. BENBOW: Objection.

THE COURT: No, I will permit it. Go ahead.

A Yes.

Q What were those conclusions?

A Well, the conclusions were that such a valve arrangement would present a problem in the timing in relationship to the cycling of the unit.

Q What was the problem?

A The problem was that in order to allow the unit to operate or cycle normally --

Q That is the Perma-Vac unit itself?

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A The Perma-Vac unit -- the sensing of a malfunction would have to allow a time period that was of large enough duration that it made the -- created a situation where at high speeds even if there was a malfunction you would lose substantial stopping distances as a result of this time interval.

Q Did you, sir, arrive at a minimum time delay beyond the normal cycling of the Perma-Vac which would be required before the system was effectively bypassed?

MR. BENDOW: Objection.

THE COURT: No, I will permit it.

A Well, the cycle of the Perma-Vac varies, the cycle time. It could take somewhere in excess of .3 seconds before release and reapplication of brakes, which is over a quarter of a second.

Q Did you calculate the minimum amount of time that would be required beyond that .3 seconds to bypass the system?

MR. BENDOW: Objection.

THE COURT: No, I will permit it.

A That would depend on the response time or whatever device you were working with.

Q By device that you were working with you mean the bypass device that was built?

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A Yes, that's correct.

Q And that time would vary according to the design or the construction of that device?

A That's correct.

Q Can you tell me whether you arrived at a minimum time that such a device would require to function beyond the .3 seconds to which you have referred?

MR. BENBOW: Objection.

THE COURT: I think what you are trying to ask -- I will sustain the objection -- I think what you are trying to ask is did you arrive at an ideal minimum time beyond the .3 seconds at which your device should work, this bypass. In other words, was there a goal towards which you were aiming?

THE WITNESS: I don't remember any in those terms at this point.

Q Did you determine, sir, that any delay beyond the .3 seconds was unacceptable to you?

MR. BENBOW: Objection.

THE COURT: I will permit it. If you remember.

A I vaguely remember some tiem element, but I can't pin it down exactly right now.

MR. GRAND: Can I have my question read

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back? I don't think the answer is responsive.

THE COURT: Sure. Go ahead, read it back.

(Question read.)

THE COURT: I think the answer is responsive. He said he vaguely remembers a time, but he doesn't recall what it is.

Q Is it your testimony then, sir, that there was a time period in addition to the .3 seconds which was acceptable to you for the functioning of such a device?

A Well, I think it was -- the problem was the other way around, as I recall, thinking about it. If, for example, the time period was of too long duration after the .3 seconds you would cut the unit out when it was normally operating properly. In other words, if the unit released, started releasing the brakes --

Q I don't think you mean that.

THE COURT: Let him answer, will you, please?

Go ahead, continue.

A The device -- I have lost my train of thought. I am sorry.

THE COURT: All right.

MR. GRAND: I am sorry. I interrupted

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Perhaps the best thing is to reread the question and the answer. I apologize.

MR. BENBOW: The question, at least.

THE COURT: Read him the question.

(Question read.)

MR. BENBOW: Read him the answer, if you would.

THE COURT: No. Just answer that question.

A I really don't recall.

MR. BENBOW: Your Honor, if I may suggest, sir, it might help him if he heard back what he did state. There may have been a misstatement in it that he can clarify.

THE COURT: No. You will have a chance on redirect. Go ahead.

Q Did you reject the concept that Mr. Urban brought you, this later concept, or were you and he unable to develop it to a point where you could even consider accepting or rejecting it.

MR. BENBOW: Objection.

THE COURT: I think basically the ground has been covered. I sustain the objection.

Q Mr. Romel, would a bypass valve, a hydraulic bypass valve that restored the brakes in 1/10th of a

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second beyond the .3 seconds have been acceptable to you?

MR. BENBOW: Objection.

THE COURT: No, I will permit it.

A I don't know. I don't think there was ever one that was proposed that would create that condition. I don't think that -- I think it's a pretty hypothetical situation also. I don't know.

Q You don't know whether it would have been acceptable to you if it had been available.

THE COURT: That's what he said.

MR. GRAND: Fine.

Q Did you consult, sir, with anybody in the automotive industry in December, '65 or January, 1966 to ascertain whether such a valve would have been acceptable or such a time delay would have been acceptable --

MR. BENBOW: Objection.

Q -- by automotive standards?

THE COURT: There are three questions involved in that one. Sustained.

First of all, in connection with your research during December, 1965 and January, 1966, did you contact anyone from the automotive industry?

THE WITNESS: In relationship to a by-pass valve?

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THE COURT: Yes.

THE WITNESS: No.

THE COURT: You didn't?

THE WITNESS: No.

THE COURT: Okay. He didn't contact the automotive industry.

MR. GRAND: Fine.

Q Yesterday at the close of the testimony, Mr. Romel, I hand you a patent application and what appears to be a summary of a patent application and asked you to look at them. Have you had an opportunity to look at those documents since yesterday afternoon?

A Yes.

Q Can you tell me, sir, whether --

THE COURT: Are they identified by numbers?

MR. GRAND: I will have them marked, your Honor.

THE COURT: All right.

MR. GRAND: I intend to.

THE COURT: All right.

Q Did you, sir, see either of those documents prior to December 21, 1964?

A The two-page document I believe I did.

Q And that is a document entitled "Perma Anti-

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THE WITNESS: Fifty-five.

THE COURT: Okay.

Q Mr. Murphy, are you a graduate engineer?

A Yes.

Q Would you briefly describe for us your educational background?

A I received a Bachelor of Science in mechanical engineering from Purdue University in 1942. I received a Master of Science degree in industrial engineering in 1950 from Columbia.

Q Mr. Murphy, I would like to turn to your employment background. Upon receiving your Bachelor of Science degree in mechanical engineering from Purdue University in 1942 by whom, if anyone, were you employed?

MR. DE RENSIS: Your Honor, I object because I think in view of the limited nature of the testimony that is going to be offered --

THE COURT: We might as well get it in. Go ahead. It is just background.

MISS TAYLOR: If you prefer, I will rephrase that to facts preceding the contract.

THE COURT: No, no. Go ahead.

A The U. S. Army.

Q During what period of time were you in the

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Elizabeth factory?

A Yes.

Q During the period between June, 18, 1964 and December 21, 1964, did you have any direct contact with any representative of Perma?

A No.

Q Let me return to Mr. Morris' reports.

Were such reports pursuant to your instructions?

A Yes.

Q Approximately how often did Mr. Morris make such reports to you during this period?

A I used to visit the factory every couple of weeks, and we'd go over an agenda of projects in the factory.

Q In other words, Perma was one of the projects upon which Mr. Morris reported to you periodically?

A Yes.

Q Now, between the period June 18, 1964 and September, 1964, do you recall the specific reports which Mr. Morris made to you concerning the Perma project?

MR. DE MENSIS: I object.

THE COURT: No, I will permit it. The answer should be yes or no, do you recall it.

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THE WITNESS: Yes.

THE COURT: What did you see?

THE WITNESS: Well, test equipment for testing out components of the Perma anti-skid.

THE COURT: And were tests being run?

THE WITNESS: I have seen tests being run, yes.

THE COURT: Was there any group of workers actually producing the device that you recall seeing?

THE WITNESS: Yes.

THE COURT: Anything else that you saw there?

THE WITNESS: I saw problems of quality in the receiving inspection area, ~~pacts~~ parts received from vendors. The main problem in assembling the units seemed to be that this rather large --

MR. DE RENSIS: I object.

THE COURT: Wait a second now. When you were there were the workers assembling the units having problems?

THE WITNESS: I don't recall that.

THE COURT: You didn't see them having these problems that you want to talk about, right?

THE WITNESS: Only in observing them with -- I wanted to see what the problems were on a shirt-sleeve

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basis in some instances.

THE COURT: Okay. Now, when you went down to see what the problems were on a shirt-sleeve basis, what were they?

THE WITNESS: Problems with gearboxes, for instance, where we had endurance tests on gearboxes and we had problems of wear.

THE COURT: Problems of wear?

THE WITNESS: Yes.

MR. DE RENSIS: Are these things he saw, your Honor?

THE COURT: That is what he's telling me.

MR. DE RENSIS: He saw wear?

THE WITNESS: Endurance tests being run were not the proper number of hours of life --

THE COURT: All right.

THE WITNESS: -- indicating wear.

THE COURT: All right, go ahead. Tell me what other.

THE WITNESS: Problems of pressure switches not calibrated properly.

THE COURT: Anything else you remember?

THE WITNESS: In the receiving inspection area -- my background is quality control -- I did visit

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MR. BENBOW: Your Honor, you had indicated yesterday that you intended to rule on the motion to strike this morning.

THE COURT: Yes. The motion to strike the testimony is denied. The motion to strike the defense and counterclaim is similarly denied.

MR. GRAND: Your Honor, may I ask about Plaintiff's Exhibit 111?

THE COURT: Sure, you can ask about it.

MR. GRAND: Have you had an opportunity to consider that yet?

THE COURT: I will tell you on Monday.

MR. BENBOW: Your Honor, I want to apprise the court of the fact that your denial of the motion to strike at this time may require us to ask for some further delay since we may well have to now go forward with an expert witness to meet the testimony which plaintiff has offered.

THE COURT: If you are seeking a delay at this time, Mr. Benbow --

MR. BENBOW: I am not at this time, your Honor. I was just putting the court on notice --

THE COURT: I am putting you on notice. Don't bother coming back with an application, if that is what you are thinking about, for delay. There will be no delay in this case. We are going to finish it. I know it is going on forever and ever and ever, but we are going to finish it.

MR. BENBOW: That is our great desire too, your Honor, but I feel that your ruling on the motion to strike affects what we may have to do in terms of presentation of evidence.

THE COURT: Sure. I guess Mr. Grand thinks that my denial of his motion to strike your defense and counterclaim as sham affects his position too. But we

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are still going to go ahead with the trial of this case.

MR. BENBOW: Your Honor, the nature of the two situations I think is quite different. We are talking about complicated technological materials that require a considerable time for preparation. There is no way to avoid that

Now, we are willing to do it in cooperation with plaintiff. If we run these computer runs and set up these simulations, we are willing to do it the way our motion indicated they should have done theirs. But that's all going to take time. It cannot be done overnight. That is all I am trying to bring forth at this point.

If we can see our way to see it through without further application to the court, that would be our pleasure. In any case, I understand it to be a very time-consuming process, unavoidably so.

MR. GRAND: Would you like me to make a statement on this subject?

THE COURT: Not particularly, no.

Q I believe you have testified you had a discussion with Mr. Hough concerning Defendant's Exhibit 191 in evidence. Who was present during this discussion?

A To my recollection, just Mr. Hough.

THE COURT: And you.

THE WITNESS: And myself, yes.

Q Where did the discussion take place, if you recall?

A In Mr. Hough's office.

Q During this discussion did Mr. Hough give you any instructions?

A Mr. Hough instructed me to bring him up-to-date on the status of the anti-skid device and also instructed me to make a recommendation.

Q What did you say to Mr. Hough pursuant to his instructions?

MR. DE MENSIS: I object.

THE COURT: No, I will permit it. Go ahead.

A I said to Mr. Hough that I was convinced we had a going product for the market place, we were de-

bugging the problems that had existed with component parts, and I recommended that we go along with the expanded agreement with Perma.

Q Mr. Murphy, at any time prior to December 21, 1964 did you give any instructions to anyone to make a technical analysis of the fail-safety of the device?

A No.

Q Prior to December 21, 1964 did you give any instructions to test the overall function or perform-

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ance of the device?

A No.

Q In December of 1964 were you of the opinion that the device was fail-safe?

MR. DE RENSIS: I object to that.

THE COURT: Yes. His opinion is not relevant to the issues here. Go ahead.

Q In December of 1964 did you believe that the device was perfected?

MR. DE RENSIS: I object.

THE COURT: Sustained.

Q In December of 1964 did you believe that the design of the Perma device had been fully tested?

MR. DE RENSIS: I object.

THE COURT: Sustained.

MISS TAYLOR: Time period, if you are referring to his former testimony.

MR. DE RENSIS: Would you read the question.

(Question read.)

Q Was the same true in 1965?

MISS TAYLOR: Objection.

THE COURT: I will permit it.

A I spent more of my time during 1965, but it might be somewheres in the neighborhood of five to ten percent.

Q Do you know what role Mr. Peacock had with respect to the negotiations leading up to the December contract?

THE COURT: If any.

MISS TAYLOR: Objection.

THE COURT: No, I will permit it. If any.

A Mr. Peacock was the Winthrop, Stimson lawyer who was acting on behalf of Singer, Elizabeth.

Q Did Mr. Peacock prepare the December contract?

MISS TAYLOR: Objection.

THE COURT: If he knows.

A I believe so.

Q Was the primary negotiator representing Singer in the negotiations with Perma Mr. Kloby?

A Yes.

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an oral report, I believe, sometime prior to December 21. Now we are talking about conclusions. I don't know if we are dealing with the report or the oral conclusions. I would appreciate some specification.

THE COURT: If he says he was disquieted by them, then maybe we will find out why, and what they were. Go ahead, answer the question.

A There were mixed things in the Hill report. Basically, the Hill report was to be a marketing report, giving the volume of product that might be --

THE COURT: But the question is, were you disquieted by any of the conclusions? You said there were mixed conclusions.

THE WITNESS: Yes.

THE COURT: You were?

THE WITNESS: Yes.

Q Did you express that disquiet to Mr. Morris?

A I'm sure I must have.

Q Did you express that disquiet to Mr. Hough?

A No.

Q Can you tell us what it was in the Hill report that disquieted you?

MISS TAYLOR: At what time? Objection.

THE COURT: At any time. I will permit it.

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Singer Company?

A No, I am not.

Q Were you previously employed by The Singer Company in 1964 and '65?

A Yes, I was.

Q What years did your employment last from?

A 1961 through 1964.

Q Your employment in the Singer Company ended in 1964?

A Yes.

Q At The Singer Company?

A Oh, I'm sorry. Singer Company, 1967.

Q And at what facility or facilities of the Singer Company did you work?

A I worked at the Elizabeth, New Jersey factory, the headquarters facility in New York.

Q And what years were you working at Elizabeth, Mr. Morris?

A 1961 through 1964.

Q Could you tell the Court your positions you had in Elizabeth and approximately the dates you held those positions?

A I started as plant controller in 1961. I became assistant general manager, and I am not sure of the date

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for the assistant general manager. I became general manager in May 1964.

Q And can you tell the Court when your employment in the Elizabeth facility of The Singer Company ceased?

A Late November 1964.

Q Mr. Morris, I would like to ask you some questions about your educational and employment background. Do you have any advance degrees?

A I have a Bachelor of Science in business administration.

Q Where is that from?

A Miami University, Oxford, Ohio.

Q What year?

A 1950.

Q Can you give the Court a brief description of your employment experience before coming to Singer?

A Worked for Chevrolet Division of General Motors from 1950 until 1956; Chrysler Corporation, 1957 through 1959; Booz, Allen & Hamilton International during 1960; and I came to work for Singer in '61.

THE COURT: What kind of work did you do at the two automobile companies?

THE WITNESS: Basically financial work. With Chevrolet I was supervisor of factory accounting,

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Perma.

THE COURT: Who did you meet Perma, Mr. Perrino?

THE WITNESS: Mr. Perrino, Mr. Mainelli and a Mr. -- it starts with a B -- Benedetto.

Q Would that be Mr. DiBenedetto?

A Yes.

Q Who went with you from Elizabethport, if anyone?

A Ed Sprague, who was our chief engineer, and Bob Kloby.

Q Did you have any conversations with the personnel of Perma at this meeting?

A Yes.

Q Can you tell me approximately what they said and what you said?

A Well, Mr. Perrino explained that he was looking for a new vendor to manufacture this anti-skid device, he explained to us how the device worked, things of that nature.

Q Did he tell you what was wrong with their present vendor?

A Yes. At least one source was on strike and he couldn't get production from the source and he indi-

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MR. GRAND: Sure.

Q Did they show you any literature on the device?

A Yes.

MR. DE RENSIS: Your Honor, I object to asking the witness one or two items that he was shown rather than asking him what he was shown and getting a description of them because I don't think we get a complete description of what he was shown.

THE COURT: Okay. You want to do it the hard way, go ahead.

What were you shown, if you remember?

THE WITNESS: Well, we were shown a report published by some motor vehicle test bureau in New Hampshire -- I don't recall the exact name; it might have been New Hampshire Motor Research Bureau -- and certain other items. I can't recall the specifics. Articles, press releases, things of that nature, pertaining to the product.

THE COURT: All right. Showing you Plaintiff's Exhibit 19 in evidence, was that one of the items you were shown?

THE WITNESS: Yes, it was.

THE COURT: Don't we have a stack of items

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Q Mr. Morris, to go back to this conversation, you mentioned Mr. Mainelli told you something about a

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fail-safe feature. Was this fail-safe feature the switch?

A No, not per se. The way he explained it was that if anything went wrong with the unit --

Q That is, some internal failure within the unit?

A Yes -- that the unit in effect deactivated totally and reverted back to the original brake system on the car.

estimate and a quotation for manufacturing the unit.

Q Did you instruct them to do anything else?

Showing you a copy of Plaintiff's Exhibit 25A, which is a letter from -- I will let you look at it. It has a cc to you at the back.

A Yes.

Q Does this remind you of any other instructions you may have given?

A Yes. I asked that a study be made to verify the marketability of the product or the volume of the product, the potential volume.

Q Did you instruct anyone to look into anything else?

A As I recall, I asked the patent department to check out the patents and make certain that there were no infringements.

THE COURT: Did you have copies of the patents at that point?

THE WITNESS: I don't recall whether we had them at the time I gave the instructions or not.

THE COURT: Okay.

Q Did the cost people come up with a cost estimate, to your knowledge?

A Yes.

MS. RAWSON: He mentioned outside entities. I just wanted to get clear who they were.

THE COURT: Does it matter if they didn't come into existence? I know we had some talk about Monitor at one point.

THE WITNESS: That's Monitor.

THE COURT: It's in the record already. I don't think we need to go through it with this witness.

Q Do you know if there was an independent marketing survey done?

A Yes.

Q Who did it?

A William E. Hill.

Q Who suggested it be done?

MR. DE RENSIS: I object to that. What is the relevance as to what the source of the idea was? The question is who ordered --

THE COURT: Yes. Did you order it from William Hill?

THE WITNESS: Yes, I ordered it.

Q Was this with the approval of the New York office?

MR. DE RENSIS: Your Honor, what is the relevance of that?

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THE COURT: I don't know.. I will sustain the objection.

Q Did you have any discussions with the New York office about it?

A I am certain --

MR. DE RENSIS: No relevance. I object.

THE COURT: I don't see the relevance of it either. My problem is this man was in charge of a major facility for Singer Corporation. If he couldn't cause a marketing study to be made on his own I wonder about the hierarchy and red tape and bureaucracy of the Singer Corporation. But if he had discussions with the people in New York about it it would just mean that he was keeping them up-to-date.

THE WITNESS: I am sure that I made them aware at some time or other that it was going on, yes.

Q When did the Hill people report back their first results to you, if you recall?

A I recall a meeting some time in, I would say, mid-November, middish-November, maybe a little bit on the early November side, in which someone from Hill came in and gave us a verbal progress report on their findings.

THE COURT: Did you receive Plaintiff's

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57?

THE WITNESS: No, your Honor, I didn't.

THE COURT: That was after you left?

THE WITNESS: That was -- the final report came in after I left.

THE COURT: Okay.

Q At this preliminary meeting then did they give a volume projection?

MR. DE RENSIS: Objection.

THE COURT: A volume objection.

MS. RAWSON: A projection of units to be sold.

MR. DE RENSIS: It seems to me that is irrelevant because --

THE COURT: Wait. I am not sure that you want to ask that question. I sustain the objection, but I think it is more out of self-defense for the defendant.

MR. DE RENSIS: Then I withdraw my objection.

THE COURT: No. You are stuck with it now.

Q Mr. Morris, did they give you preliminary market projections.

A As I recall, they discussed ranges of market

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potential as opposed to putting out any specific finalized number.

Q Do you recall what these estimates were?

A No, I don't.

Q Did they discuss the way the unit performed?

A Not to my recollection.

MR. DE RENSIS: I object to that, your Honor.

THE COURT: He doesn't recall, so what's the difference.

Q Did hey say anything specifically regarding stopping distances?

MR. DE RENSIS: I object. It has no relevance, your Honor, because we have the final report in evidence.

THE COURT: Yes. I know. It might have some relevance though. I will permit it. Go ahead.

A I don't recall any conversations on anything other than the volume projections at the meeting.

Q Regarding these volume projections, were they higher or lower than those you had received previously?

MR. DE RENSIS: Your Honor, I --

THE COURT: At this point I think you are getting to the point of irrelevancy, unless you are trying to prove damages.

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MS. RAWSON: Excuse me.

THE COURT: Unless you are trying to prove damages.

MS. RAWSON: We are trying to show Singer's anticipations in going toward the December contract.

THE COURT: Yes, but at the same time what you are proving is Perma's anticipations in going to the December contract. I don't know whether you want to do it. If you want to I will let him answer the question.

Answer the question. Were they higher or lower than the former projections.

MR. DE RENSIS: Your Honor, I object to the form because I don't know higher or lower than what? Are we talking about the projections contained in ~~191~~ 191?

THE COURT: I assume we are talking about the projections included in 191.

A Well, as I recall the meeting, I was somewhat disappointed in the ranges that they tossed out, which leads me to surmise at this point in time --

THE COURT: Don't surmise.

A -- that they must have been lower.

Q What did you do once you got these projections?

A To the best of my recollection, I asked my controller to do some pro forma financial work on them,

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Q Have you previously given depositions in this proceeding?

A Yes, I have.

Q And have you given two sets of depositions?

A Yes, I have.

Q Mr. Kloby, do you suffer from an eye problem?

A Yes, I do.

Q Would you explain that briefly to the Court, please?

A Well, the problem technically or medically is called rhetinitus pigmentosa which is a deterioration of the retina which -- well, it keeps narrowing down the field of vision. At this point the right eye --

THE COURT: Mr. Kloby, I know what it is.

THE WITNESS: Oh, thank you, your Honor.

THE COURT: Go ahead, Mr. Benbow.

Q The reason I asked, Mr. Kloby, can you read documents?

A With considerable difficulty.

Q We will do our best. What is your educational background?

A I attended Thomas Jefferson HIgh School in Elizabeth, College Preparatory Course. After completion of high school I started -- well, I entered Seton Hall

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University in 1949.

I started as a pre-med student. I was in the pre-med course from 1949 until 1951 at which time due to my visual deficiency, I transferred to a business course. I received a degree in 1954 in business administration with a major in management and a minor in marketing.

In 1956 I again re-entered Seton Hall night school, graduate program and pursued a Master's Degree in business administration which I received in 1959 with a major in marketing.

That's the extent of my formal education.

Q Did the latter course of study include management as well as marketing, Mr. Kloby?

A Some management courses, yes.

Q Would you describe for us your employment background, Mr. Kloby, up through March of 1966?

A After graduating from college in 1954, I started with The Singer Company in its New York office at 149 Broadway with the Industrial Products Division, a division which was engaged at that time in the marketing of industrial sewing machines. I started as a trainee in their Marketing Division. I spent two years in training, both in the New York office at 149 Broadway and at one of

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their district sales offices in Newark, in learning the various operations and procedures of a marketing operation within the industrial products division, and I also during that time worked on the special project setting up a parts distribution center in Murphy's Borough, Tennessee.

In approximately 1958, after completing a training course, I guess this was about 1957, I became a market research analyst within the Industrial -- I'm sorry, it is 1956, excuse me -- I became a market research analyst with the Industrial Products Division in their New York office and performed market research surveys connected with the sale of industrial sewing machines until approximately the Spring of 1959.

In 1959 I was transferred to a new operation of the company called the New Products Group which is an operation formed to investigate new fields of diversification and possible acquisition for the Singer Corporation.

My duties -- I believe my title there was market analyst, and my duties were primarily to look for diverse fields for the company to pursue as possible areas of diversification, to study from a market research standpoint various companies within such fields and, in general, to conduct market research evaluations.

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I continued with this type of work until approximately 1963 at which time --

Q Let me see if I can refresh your recollection, Mr. Kloby. Would it have been as early as 1962 that you had some change?

A Yes, I think that is correct. It was about the FAll of 1962. I transferred -- well, at that time the Singer Company had felt it desirable for all divisions of the company to diversify, including the Elizabeth factory, and I was offered a position at the Elizabeth factory to assist in their pursuit of other areas of diverse manufacture other than sewing machines which was their only or major product at that time, and in '62 I transferred to the Elizabeth factory for that purpose, with the title of market analyst.

For approximately one year I conducted some studies at the Elizabeth factory in determination of other possible fields for them to pursue as areas of diversification.

I also, during that time, became involved in planning activities, long-range planning activities involving overall cost improvement programs and projects of that nature.

During 1963 I was given the title of -- I think

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it was coordinator of forward planning for the Elizabeth factory. I held that title until -- and this was involved with more or less again the diversification activities, new opportunities for the Elizabeth plant, plus long-range planning activities.

I held that position until about February of 1965 when I was given the title of manager of Perma project.

I remained in that position until probably, let's see, early in '66, late in '65, when I resumed activies which were more related to long-range planning, and I think you saing bring it up to March of 1966?

Q Please.

A And then from late '65 until March of '66 I was for the most part again engaged in long-range planning activities with the title, which I probably never did relininquish, of coordinator of forward planning.

Q On that point, Mr. Kloby, was your title ever director of forward planning?

A I think at one -- yes, I believe in 19 -- when I first took the position in forward planning at Elizabeth in '63, the title was director of forward planning. There apparently was some conflict with director titles at the corporate level and to avoid

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confusion, because I think that within the corporate structure a director had the equivalency of an assistant vice president, and in order to avoid that type of confusion, the title was changed to coordinator of forward planning.

Q What were your responsibilities as coordinator or director of forward planning during the period February 1964 through June of 1964?

A My primary responsibility and duties were to analyze possible areas of diversification for Elizabeth, new ventures which would permit them to more fully utilize their manufacturing capabilities and capacities and to formalize with a more or less formal approach programs along those lines.

Q What was your first contact with the Perma device, if you recall?

A The first time I ever heard of the Perma device came in January of 1964. Mr. Phelps of our New York office called me and told me that he had been given a routine communique from our Canadian branch, saying that there was a device called the Perma anti-skid, whose principals were looking for a possible source of manufacture or another possible source of manufacture, and he was going to buck it over to the Elizabeth factory

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THE COURT: Okay. Go ahead, Mr. Benbow.

MR. BENBOW: Thank you, your Honor.

Q In that telephone call did you arrange for a date to meet at a particular place?

They had a meeting. We have heard about it from at least four witnesses. Can't we at least get it?

THE COURT: All right. Let's go to the meeting.

Q Where did the meeting take place or where was it to take place?

A The meeting took place at the offices of Perma Research & Development Company in North Attleboro.

Q Did you tell Mr. Perrino in that conversation you intended to bring anyone with you?

MR. GRAND: What difference does it make? I object.

THE COURT: Who went with you to the meeting?

THE WITNESS: It was myself, Mr. Ed Sprague, the chief engineer, and Mr. Cecil Morris, the assistant general manager.

THE COURT: Okay. Now, let's get right to the meeting.

Q Did Mr. Perrino arrange to meet you --

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MR. GRAND: I object.

Q -- at any place prior to North Attleboro.

MR. GRAND: I object.

THE COURT: Wait a second. Prior to the meeting at North Attleboro?

MR. BENBOW: Yes.

MR. GRAND: And drive him to the plant or something like that?

THE COURT: Stop it, will you?

Did he arrange to meet you at some place prior to the meeting at North Attleboro?

THE WITNESS: No. He had arranged to have us picked up at the airport.

MR. GRAND: That's what I am talking about, Judge.

THE COURT: Okay. Let's get down to North Attleboro, the meeting there.

Q Did you and Mr. Morris and Mr. Sprague, I think you said, Mr. Kloby, go to Boston and meet with Perma people in North Attleboro?

A Yes, we did.

Q On your arrival at Perma what took place?

A Well, I met with Mr. Perrino, introduced ourselves. At that time Mr. Perrino suggested that we

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first have a demonstration of the Perma-anti-skid.

You want me to just go on and tell what happened?

THE COURT: Yes.

A He said we would have a demonstration of the anti-skid device, at which time Mr. Morris and Mr. Sprague and myself went through their premises, which was a cinder-block-type building. On going through to the back, to the garage, he pointed out the various offices of the building, the engineering department, which was a one-room affair, and the various --

MR. GRAND: I am sorry. I missed something after engineering department.

THE COURT: Which was a one-room affair.

A -- the various offices of the people that worked there, Mr. Krawczyk's office, Mr. Karp's office. We went from that building to a garage, which was --

THE COURT: Don't tell us about the garage. Inside the garage there was a car, right?

THE WITNESS: Right.

THE COURT: You got in the car and you took it down a demonstration ride?

THE WITNESS: No. Mr. Mainelli was in the car. I stood outside.

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Mr. Mainelli performed a demonstration driving down the driveway next to the building and along an asphalt area which continued behind the building by the garage. I believe he made two runs with the device on, one with the device off, I think it was.

MR. GRAND: Is that two plus two.

THE WITNESS: Mr. Perrino -- while Mr. Mainelli was giving the demonstration in the car Mr. Perrino was generally explaining what was happening, that the wheels were pulsating, that the brake pressure was modulating around the braking point, the wheels would intermittently lock and release. Then --

Q Mr. Kloby, before you go on, could you describe for us the nature of the surface on which these --

A Asphalt driveway. It was dry. There was snow on the ground that day. There were some wet areas around -- in North Attleboro and in that general area, but I would say that the surface was dry.

We were given a demonstration next -- that's myself, Mr. Sprague and Mr. Morris -- in the car, repeating pretty much what Mr. Mainelli had done the first time; drove down the driveway, hit the brakes, and the unit pulsated, came to a stop.

Then because I believe the unit -- the drive-

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way was dry it was suggested by Mr. Perrino that we go out to the mountain area or the surrounding area and try and find a more suitable area for demonstration, one which had a wet surface.

Mr. Mainelli then took Mr. Sprague, Mr. Morris and myself for a ride on these country roads. It was a two-lane asphalt-type road, trees on both sides. He proceeded to demonstrate the device about four or six times, a couple of times in the middle of the road and about twice on a narrow shoulder with two wheels on the surface, I think two wheels on the shoulder of the road.

THE COURT: On the shoulder of the road was there snow?

THE WITNESS: No. The roads were wet. As I remember, it had snowed and it was a warmer day then, and the snow was melting and running across the road. The shoulder was wet, but I wouldn't say it was a lot of snow or even any snow.

THE COURT: Okay.

THE WITNESS: The shoulder was very narrow and there were trees along both sides. It wasn't really very suitable for a demonstration, I don't think.

Mr.Mainelli pointed out that there was a switch in the car, that he could turn the unit on or off,

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make it operative or inoperative, as he chose, to demonstrate it.

I think at that point he also gave a description of the device, indicating how it modulated around the brake pressure, how it pulsated. He offered to have one of us demonstrate it, you know, the device, if we so chose, and we all declined. It was a little bit of a narrow area. I don't think anybody wanted to take any chances.

Then we returned to the Perma offices and Mr. Perrino then showed us a film. The film was --

THE COURT: Hold it a second. Maybe I can shorten this.

Mr. Grand, are you willing to stipulate that the film that was shown is the film --

MR. GRAND: Of course.

THE COURT: Okay. Don't tell us about it. We have seen it.

THE WITNESS: Let's see. After the film --

Q What do you remember from that film?

MR. GRAND: I object. It's in evidence. What difference does it make what he remembers.

THE COURT: It's just been stipulated that

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it is the same film that I have seen and I have gone through Lord knows how many descriptions. Let's not have another one.

Go ahead. What happened next?

MR. BENBOW: Could he briefly give a description, your Honor, of what he presently recalls from the film?

MR. GRAND: What difference does it make? I object to it.

THE COURT: We have seen the film already, Mr. Benbow. What he remembers doesn't count. It might show a bad memory on his part. If that is what you want to show why don't you wait until cross examination.

MR. BENBOW: Your Honor, I think it is significant -- and I don't wish to insist -- I do think it is significant those things that impressed themselves on his mind about this film certainly at the time.

MR. GRAND: I object.

THE COURT: Sustained. Go ahead. What happened after the film?

THE WITNESS: Mr. Perrino showed myself and the other gentlemen some articles about the device from Mechanics Illustrated or Popular Mechanics -- I am not

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sure which -- some reprints from testimonials from safety councils or police departments, showed us a copy of I think it was Motor Vehicle Research Bulletin 13.

Then he gave us a demonstration -- not a demonstration -- I guess it would be an explanation of the function of the unit using a cut-away model that he had on a table in his office.

Q Mr. Kloby, before you go on with the description of that I would like to stop just for a moment.

MR. GRAND: I will stipulate that that is the document he saw at some point. Whyput him through that?

THE COUKT: Plaintiff's 19.

Q You recognize that, Mr. Kloby?

MR. GRAND: Of course.

A Definitely.

MR. GRAND: It is stipulated.

Q Would you look at Plaintiff's Exhibit 20.

MR. GRAND: You want a stipulation on that too? You have it. I mean, why do that to this man?

THE COURT: There is a stipulation that he was shown all or part of the documents contained in Plaintiff's Exnibit 20.

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Q Before you go on, was there any reference to fail-safety by Perma representatives?

A Well, he indicated that in his explanation of the unit that it had fail-safe features and that in case of a failure, that the car would revert back to its normal braking. That's all I recall in that regard.

Is that the meeting to which you have referred, sir?

MR. GRAND: I will stipulate.

THE COURT: All right.

MR. BENBOW: Could I have a brief recess at this point, your Honor, or would you prefer that I go forward?

THE COURT: I prefer you go forward. You only have a couple of minutes left.

MR. BENBOW: All right.

BY MR. BENBOW:

Q Did there come a time, Mr. Kloby, if you recall, that Mr. Perrino came to Elizabethport?

A Yes.

Q And did anyone accompany him, if you recall, on that occasion?

A The occasion of his first visit?

Q His first visit.

A Yes. I believe Mr. DiBenedetto and Mr. Mainelli. At least, I recall those two gentlemen.

Q You have just testified with respect to a March 13th meeting at Singer. Bearing that in mind, can you date for us approximately when Mr. Perrino paid this first visit to Elizabethport? Would it have been that

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month or the next month or do you recall?

A I think it was in April. I don't think it was in March. I think there was -- his first visit was around April.

Q With whom did he and Mr. Mainelli and DiBenedetto meet on that occasion at Singer, if you know?

A Well, he first came and met with me briefly and I performed the function of taking them around and meeting other people at the plant.

Q Who did they meet?

A They met --

Q What were the job categories of the people that they were meeting?

A That meeting was primarily with engineering people. They met in one of the engineering rooms. It was one of these all-day meetings, as I recall, where they came down to discuss the unit and how it was put together, how it worked, to give our engineers, Mr. Sprague, Mr. Romel, Gomes, Stein, Plungis, and many others -- I don't recall all the names -- a group of our engineering people, an orientation in how the unit worked, answer questions regarding blueprints, specifications, missing data, etc. That was pretty much the purpose and scope of the first meeting.

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Q Do you recall, Mr. Kloby, if there was a disassembly of the Perma device by the Perma folks at that meeting?

A As I recall, the unit had already been disassembled and was spread -- in fact, I think there were two of them. All the parts were spread over two tables and they were laid out in some logical fashion, at least, related to one another, and Mr. Perrino somewhat systematicall went through all the components and how they related to one another, a lot of questions and answers.

THE COURT: I assume the movie was shown again.

THE WITNESS: I think so. I am not sure of that.

THE COURT: All right. Gentlemen, I have to break early to take care of another case. Be back tomorrow morning at a quarter to 10.

MR. BENBOW: Thank you, your Honor.

(Adjourned to June 4, 1974, at 9:45 a.m.)

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Q What, if anything, do you recall at the April meeting that Mr. Perrino said on the subject of fail-safety, Mr. Kloby?

MR. GRAND: I thought we had the whole meeting yesterday.

THE COURT: Go ahead.

A On that subject, when he described the unit and its function to the engineers at the meeting, he noted that it has fail-safe features and that it would revert the brakes back to their normal state in case of a failure.

Q What did Mr. Perrino state, if anything, on

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the subject of directional stability?

A In describing the function of the device, he said that it provided directional stability in a panic stop situation, that it was fully tested, reliable, and again, the fail-safe features.

Q Mr. Kloby, did there come a time when there was another meeting at Elizabethport between Perma and Singer?

A I set up another meeting at Elizabeth for MR. Perrino, Mr. DiBenedetto, I believe Mr. Mainelli, and I think Mr. Karp was there at that time, which was a meeting with the various functional division heads at the factory, Mr. McDonald, who was the controller, Mr. Sprague, chief engineer, Mr. Facko, manufacturing head of the fabrication area, Mr. Larrouse, who was head of our quality control division, Mr. Broeker, Mr. Morris, and at that time Mr. Perrino again described the unit.

THE COURT: When was the meeting?

THE WITNESS: It was some in May, your honor.

THE COURT: All right.

Q Was the film shown on that occasion, do you recall, Mr. Kloby?

A Yes. I think that's how the meeting pretty much started out. Mr. Perrino ran the film, handed out some copies of Bulletin 13, he gave a description again of how the unit functioned with the cut-away model, and again described the operation of the unit, the operation of the sensing device, the fail-safe features, went

through some of the background on the unit, how it had been tested, again he I believe used Bulletin 13 to make some of his points, he pointed out the shorter stopping distances with the unit, and I would say pretty much covered the unit in its performance as opposed to getting into any specifications or assembly areas. It was an orientation-type meeting for key functional areas of the factory.

Q You mentioned Report No. 13. I take it that is what you were shown yesterday, Plaintiff's Exhibit 19.

MR. GRAND: There is no question as to what that document is.

THE COURT: It is obvious. Go ahead. It is, right?

THE WITNESS: Motor Vehicle Research --

THE COURT: Yes, it's Plaintiff's Exhibit 19. Go ahead.

seconf offer, stating that he wanted Singer to pay off his creditors and to establish some type of a royalty arrangement and then Singer would assume marketing responsibility for the device. I said that I would take that and discuss it with Singer management.

Next I wrote -- based on that offer and discussions with Mr. Morris, I wrote a memorandum to Mr. Morris outlining the Perma proposal and what I felt to be alternative positions that were open to us at that time with respect to the status of the project.

THE COURT: All right. That memorandum is in evidence, right?

MR. BENBOW: It is, your Honor.

THE COURT: What is the exhibit number?

MR. BENBOW: Defendant's Exhibit 191, sir.

THE COURT: All right. Go ahead. What happened next?

Q At or about this time, Mr. Kloby, were you having any discussions with William E. Hill & Company?

A Yes. Just prior to I guess writing that memo or some time in mid-October I had requested William E. Hill, based on instructions given to me by Mr. Morris, to conduct a market study, a market research study of the

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market potential for the anti-skid.

Q Mr. Kloby, I would like to show you Defendant's 191. Do you recognize that as your October 21, 1964 memorandum?

A Well, the covering letter is not my memorandum. The report itself is my report.

Q Correct, sir. Let me take it and ask you something further with respect to it, if I may.

At page 3 of your memorandum you state, Mr. Kloby:

"As part of such an agreement Singer would be assuming additional engineering responsibility, such as Prototyping of new model cars, testing and further product development and refinement."

What did you intend by the phrase "further product development and refinement"?

MR. GRAND: Objection.

THE COURT: Go ahead, answer it.

A The adaptation of the unit to automobiles and new developments in automobiles, such as disk brakes or front wheel drive, things of that nature.

THE COURT: Mr. Kloby, the adaptation of the device to an automobile, what did you generally call that?

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Q All right, sir. Thank you.

Mr. Kloby, were you in communication wit any of Perma's creditors at or about October 21, 1964?

A Yes, I had a couple of calls from Singer -- excuse me -- from Perma's creditors during I believe November of 1964.

Q What was the nature of those calls, if you recall?

MR. GRAND: I object.

THE COURT: Does this have any relevancy to this particular case?

MR. BENBOW: I believe so, your Honor.

MR. GRAND: Maybe he could --

MR. BENBOW: And it will be brief.

THE COURT: I will listen to the answer. Go ahead.

A Well, they had -- they told me that they were about to cut off Perma's credit. I think one was American Airlines. I can't recall the other one. Perma had told them that we were about to enter --

MR. GRAND: I object to what Perma told American Airlines.

THE COURT: I agree. The objection is sustained. Go ahead.

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THE COURT: Who is Mr. Dawes? That's a new name, isn't it?

THE WITNESS: He was a member of the New Products Group, part of Mr. Bruder's operation, who was the head of the diversification acquisitions group of the corporation, a corporate staff function.

THE COURT: Okay.

Q Did they or any of them direct you to report to them as to your advice with respect to the Perma negotiations in the course of these discussions?

A Yes. Mr. Hough reported -- instructed me to report on the status of the device.

MR. GRAND: Have we got a particular meeting, or is this the Hough meeting in Elizabeth?

THE COURT: We don't have it yet, but we will get it eventually. Mr. Hough told you something?

THE WITNESS: I had a meeting with Mr. Hough.

THE COURT: When was that?

THE WITNESS: In November.

THE COURT: In November, in New York?

THE WITNESS: In New York.

THE COURT: Okay.

THE WITNESS: He asked me about the status of the Perma device, for the most part what it was, what was

the market potential, what problems, if any, we were having.

I told him that it was a developed device, we were having some component problems.

MR. GRAND: I object to this. I object.

THE WITNESS: Shall I continue, your Honor?

THE COURT: These are all your conclusions that you are giving to Mr. Hough; is that correct?

MR. GRAND: Based presumably on what others told him.

THE WITNESS: No, some of them were or most of them were really things that Perma had told me regarding the state of the device. Others were facts regarding the component problems we were having at the time.

THE COURT: Where did you get that information?

THE WITNESS: From our engineering people.

THE COURT: Who?

THE WITNESS: Meetings -- Mr. Romel and for the most part they gave us a status report on the device as it appeared at that time, to us at Elizabeth, and an indication of the market potential from the information received from William E. Hill.

THE COURT: All right.

THE WITNESS: Met with Mr. Dawes in November,

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and also Mr. Phelps in November, and pretty much told them the same information.

THE COURT: All right, Mr. Benbow.

Q How about Mr. Murphy?

A Mr. Murphy also, in November.

Q What did you tell Mr. Hough and others about the component problems, if you recall, Mr. Kloby?

A We were having some component problems .

MR. GRAND: I object to this.

THE COURT: Wait until you hear it. You might not.

MR. GRAND: If I can reserve.

A Well, we felt that the component problems were resolved as of November or --

MR. GRAND: That's why I objected, your Honor, because all we are getting from him is hearsay conclusions based on whatever Romel told him that he is passing up the ladder, and also, unless we are going to accept the ostrich theory of representation here or misrepresentation, I don't think anything is relevant or probative of anything.

THE COURT: And you move to strike?

MR. GRAND: I do.

THE COURT: Granted.

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MR. BENBOW: Correct, sir.

THE COURT: All right. All the rest of it is speculation.

MR. BENBOW: I believe the witness has knowledge on this subject, your HOnor, and should be permitted to give it.

THE COURT: Did you ship in December?

THE WITNESS: No, sir, not that I recall. No, sir.

THE COURT: That, Mr. Benbow, is the way to get around it.

Don't ask him to speculate as to what they would have done if they so and so forth. They did it.

Q In making the shipments in November, did Singer believe, in November, that the then-known --

MR. GRAND: Your Honor, I think --

Q -- problems had been adequately resolved?

MR. GRAND: I object.

THE COURT: Sustained.

MR. BENBOW: I will withdraw it, your Honor.

Q Mr. Kloby, were there further negotiations with Parma between October 21st, the date of your memorandum contained in DX-191, and early December of 1964?

A Were there negotiations?

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Q With Perma.

A Yes, sir.

Q Could you describe those for us?

A I met with Mr. Perrino --

THE COURT: When was this?

THE WITNESS: During November.

THE COURT: Where?

THE WITNESS: At Elizabeth.

THE COURT: Who was there?

THE WITNESS: It was a number of occasions, your Honor. Sometimes only myself, sometimes myself and Mr. Patten.

THE COURT: Okay. Start with the first one and tell us what was said.

THE WITNESS: Excuse me, I don't recall what was said, your HOnor, only that we discussed such items as liability -- Perma's creditors' list, clauses of contracts, who their creditors were, what liabilities we may be assuming or not assuming; actually details of the December 21st contract.

Q Mr. Kloby, in these post-October 21 negotiations, did you state on any occasion that the entry into what became the December contract would justify a larger budget and that Singer would be able to put people on that we

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talked about?

A No, I did not.

Q Did you state in those negotiations that you would put an automotive engineer on the project?

A No, I didn't.

Q You did not?

A Did not.

Q Mr. Kloby, did Worcester Stamped Metal come to play a role with respect to these ongoing negotiations?

MR. GRAND: I object.

THE COURT: I don't know where this is going, but I will permit the answer.

A Well, yes, they did. It probably slowed them down, if anything. They had an injunction issued against, I believe, Perma which kind of stopped things around early December, and then required that we end up negotiating with Worcester to buy a portion of inventory which was in dispute between Worcester and Perma.

THE COURT: All right, that's enough. Go ahead.

Q Did you have any discussions with Mr. Murphy on this subject?

A Yes, I did. In early December.

MR. GRAND: I object to the discussions.

THE COURT: He's just giving the time, in early

December.

Q What role, if you know, did Mr. Murphy play in connection with the problem?

MR. GRAND: I object.

THE COURT: Sustained.

Q You mentioned that the Worcester injunction against Perma might have delayed, if anything, the negotiations, I believe you stated, Mr. Kloby.

MR. GRAND: If there is any more testimony, I move to strike this man's speculation about the effect of that injunction. I object to this.

THE COURT: Let's find out what the next question is going to be.

Q Were there any other factors that delayed entry into the December contract?

MR. GRAND: I object.

THE COURT: Were there any other factors? I have no idea what they are.

MR. GRAND: What possible relevance could it have?

THE COURT: I understand. Let me hear what they are.

Go ahead, answer the question.

A Factors that delayed entry into the December

21st contract other than the injunction?

THE COURT: Yes.

A Only the normal routine of checking creditors lists and checking inventories and verifying the validity of the liabilities that we were assuming, nothing else that I know of.

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Q Did that become a substantial process, Mr. Kloby?

MR. GRAND: Objection.

THE COURT: For the life of me, now I can't understand the relevancy. Did you know what the answer to that question was before you asked it?

MR. BENBOW: I didn't hear the answer. Could I hear it back?

MR. GRAND: I don't think there was one.

THE COURT: Not the question that was objected to; the one before that. Did you hear the answer to that?

MR. BENBOW: I thought I had, your Honor. Could I hear it back again, please?

THE COURT: Sure. Go ahead, read it.

(Record read.)

THE COURT: Objection sustained.

Q Let me rephrase it, if I may, in light of the prior question or your response to the prior question, Mr. Kloby.

Was there to be an assumption of liabilities as a part of the December contract?

THE COURT: Sustained.

Q Did you spend time personally checking on

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Perma's creditors?

MR. GRAND: I object.

THE COURT: What relevance this has, I have absolutely no idea. Sustained.

Q Mr.Kloby, prior to December 21, 1964 had Singer engaged in ~~permance~~ performance testing of the Perma device, if you know?

MR. GRAND: I object.

THE COURT: Sustained. Mr. Kloby, are you an engineer?

THE WITNESS: No, sir.

THE COURT: Have you ever done any performance testing?

THE WITNESS: No, sir.

THE COURT: Okay. Go ahead, Mr. Benbow.

MR. BENBOW: Thank you.

BY MR. BENBOW:

Q Prior to December 21, 1964, if you know, did the engineers at Singer rely on the Motor Vehicle Research of New Hampshire report which you were shown yesterday, Plaintiff's Exhibit 19?

MR. GRAND: I object.

THE COURT: Sustained.

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Q If you know, Mr. Kloby, had there been an analysis of the fail-safe characteristics of the Perma device by Singer prior to December 21, 1964?

MR. GRAND: I object.

THE COURT: Sustained.

Q Mr. Kloby, if you are aware, had there been any testing of stopping distances by Singer prior to December 21, 1964?

MR.GRAND: I object.

THE COURT: Mr. Benbow, we had Mr. Romel here, went all through what he did. He was the chief engineer. Here we have a man who had nothing to do with the engineering. Why ask him about it?

MR. BENBOW: He had something to do with the negotiation of the December 21st contract.

THE COURT: Fine. Let's go to that. Great.

MR. BENBOW: If I could ask some questions that he may be aware of, your Honor, related to this technical area, let me try these, please, sir.

THE COURT: All right.

Q On this latter subject of stopping distances, Mr. Kloby, had Singer ever received actual reports from the automotive companies prior to December 21, 1964.

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MR. GRAND: Objection.

THE COURT: Sustained. Mr. Kloby, did you ever receive any reports from any automotive company on stopping distances?

THE WITNESS: No, sir.

THE COURT: Did you ever ask for any?

THE WITNESS: Prior to December 21st?

THE COURT: That's right.

THE WITNESS: No, sir.

THE COURT: Did you ever ask for any?

THE WITNESS: No, sir.

THE COURT: Did you receive the Hill report?

THE WITNESS: Yes, sir.

THE COURT: Did you read it?

THE WITNESS: Yes, sir.

THE COURT: Okay. Go ahead, Mr. Benbow.

BY MR. BENBOW:

Q Did you have any discussions with Mr. Perrino prior to December 21, 1964 on the subject of automotive company stopping distances?

A No, sir.

Q Did you ever discuss the testing by the OEM

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people in general with Mr. Perrino?

A On a number of occasions, yes.

Q Would you tell us of such conversations, as you recall, prior to December 21, 1964?

THE COURT: When was the first one?

THE WITNESS: Prior to June.

THE COURT: Who was there?

THE WITNESS: I don't recall who was there.

THE COURT: Where was it?

THE WITNESS: At Elizabeth.

THE COURT: What was said?

THE WITNESS: Mr. Perrino had stated that the EOM people were testing the device.

THE COURT: This is prior to June?

THE WITNESS: Yes, prior to June. Also this was -- Sam Karp had mentioned this also. He had stated that Ford was testing it and General Motors was testing it, Cadillac. That was General Motors. That's the ones I recall. He stated that Chrysler had been approached, but I don't know if they tested it.

THE COURT: Let's get on to the next conversation. What was the next one?

THE WITNESS: We had -- I recall discussions in or about September of 1964. When I asked Mr.

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Perrino about the status of some of the approaches to the automotive people and generally whether the results of their testing was favorable or unfavorable Mr. Perrino stated generally that although some testing was done that he was dissatisfied with the way that they tested, they had used soap strips, in some instances, I believe it was Ford, used unfair or improper methods of testing the device -- I think one instance was no hands on the wheel, as he described it -- and he had stated that he don't know how favorable the approaches to the OEM people or market would be because he said that they were developing their own guides and that they had a built-in prejudice for giving a favorable result to something that could eventually become a competitive device to their own.

BY MR. BENBOW:

Q Did he say anything about the age of the units that were being tested?

MR. GRAND: I object to this.

THE COURT: No. It is outrageously leading, but I will permit it. Go ahead.

A Well, he said they had tested -- they had been testing these devices since I think early '64 at least and that there were different versions or vintages of units that had been under test, which also tended to bias the

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results.

Basically that's all I remember of those conversations.

We did from time to time even during the summer of 1964 -- I had asked him how things were going with OEM and until probably late in '64 he indicated they were still pursuing the OEM market. That's in general what I remember of those conversations.

THE COURT: But you do recall him saying that the OEM people were developing their own devices and had a prejudice for their own hardware, is that correct, or something along those lines.

THE WITNESS: Yes.

Q Did he indicate to you what you should attribute to this automotive company testing?

MR. GRAND: I object to this, your Honor.

THE COURT: We are getting to the point now of leading upon leading upon leading. I will permit it.

MR. GRAND: He is trying to undercut the Hill report, but he is not even talking about the Hill report, he is talking about months later.

THE COURT: I am well aware of what is going on. Please, Mr. Grand, don't argue now.

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Go ahead, answer.

A I think, as I pretty much stated, I didn't feel I should give too much weight to whatever they had said about it because of this method of testing, vintage of items tested and their own biases.

Q In fact, did he tell you to disregard them?

MR. GRAND: I object. Really, your Honor, I just don't think that Mr. Benbow ought to be allowed to do this.

THE COURT: Absolutely. It is now getting to the point of being not only outrageous, but obnoxious. If you want to testify, Mr. Benbow, you can, but you weren't there. He has done his best to tell us what was said.

MR. BENBOW: Fine, your Honor.

Q When you received the Hill report, to which Mr. Grand has just referred, Mr. Kloby, to whom did you forward it?

A To whom did I forward it?

Q Yes, sir.

A I believe I received a number of copies. I gave one to Bob Patten, I gave another one to Carl Broeker. I don't know if I gave a third copy to Mr. Murphy, but I know he had a copy. I am not sure if it

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was a third copy or a fourth copy or my copy or Mr. Broeker's copy. But that seemed to be the dissemination of the report that I remember directly from me.

Q Did you have discussions, if you recall, with those people or others as to the Hill report after you had received it?

A Yes. I discussed it with Mr. Patten and Mr. Broeker.

Q And what was the nature of those discussions?

MR. GRAND: I object.

THE COURT: Sustained.

Q What was your focus of attention, Mr. Kloby, upon your receipt of the report?

MR. GRAND: I object. Very softly, but very emphatically.

THE COURT: Sustained.

Q Mr.Kloby, if you recall, what aspect of the completed Hill report was of interest to you?

MR. GRAND: Same objection.

THE COURT: Same ruling.

Q Mr. Kloby, more directly, how did you view the Hill report?

MR. GRAND: I object.

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THE COURT: Mr. Benbow, we have in the record already the Hill report, we have the ordering of the Hill report. How this particular witness viewed the Hill report is really totally irrelevant.

MR. BENBOW: He initiated it, your Honor. He knew what its purpose was.

THE COURT: Did you initiate it, Mr. Kloby?

THE WITNESS: I instructed William E. Hill to perform the study.

THE COURT: You did, you initiated it, right?

THE WITNESS: Initiated it?

THE COURT: Yes.

THE WITNESS: I instructed --

THE COURT: No, no. Answer my question. Did you initiate, as Mr. Benbow just said, the Hill report? Did you or no?

THE WITNESS: No, not initiate, no, sir.

MR. BENBOW: I am sorry if I misspoke, your Honor. I was under the impression that he certainly had a role which perhaps I obviously mischaracterized as initiation. But he did meet with the Hill people on November 11th and I was proceeding on that.

THE COURT: All right. Go ahead.

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It is time for lunch, Mr. Benbow. I will see you back here at 1:15.

MR. BENBOW: Thank you, your Honor.

(Luncheon recess taken.)

Q Mr. Kloby, after this information from Perma

had been received by Mr. Romel in Singer, what, if anything, did you do with respect to the information therein contained?

A I discussed it with Mr. Perrino.

Q And what did you discuss with Mr. Perrino?

THE COURT: First of all, when did you have the discussion?

THE WITNESS: I had a discussion with Mr. Perrino, I would say, in late January 1965.

THE COURT: Where was it?

THE WITNESS: I believe this was a telephone conversation. I'm not sure of the --

THE COURT: All right. What was said?

THE WITNESS: I had asked Mr. Perrino about the information, that it appeared to me that this was a lot of information that he had in his file --

MR. GRAND: I object to what appeared to him.

THE COURT: No, not what appeared to you. What did you say?

THE WITNESS: I said to him it looked like information that he had prior to the December 21st contract, and I told him that the information showed test results that we weren't aware of, and I asked him why he hadn't provided us with this information before.

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Some of it appeared to be aged, and he said something to the effect that, "If I had told you everything about this product before December 21st I doubt whether you would have signed the contract."

CROSS-EXAMINATION

BY MR. GRAND:

Q Mr. Kloby, how old are you?

A 42, sir.

Q And am I correct that the sole employer you had in your adult life has been the Singer Company?

A Not the sole employer; the sole employer since college.

Q Fine. And that is since 1954?

A That's right.

Q And am I also correct that you are not eligible for retirement from The Singer Company for some thirteen years, that is, early retirement?

A That's right.

Q And am I also correct that you hope to continue in the employ of the Singer Company?

A I have no reason to believe otherwise.

Q You testified, sir, at Page 6116, in response to the question, "What was your function in your new capacity"?

And that is referring to after the December 21, 1964 contract.

Your answer was, "To coordinate the marketing and manufacturing activities under this new contract or

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new Perma program."

And in that capacity, Mr. Kloby, you had the title of Manufacturing Manufacturer of Perma? What was the title?

A Manager of Manufacturing.

Q Manager of Manufacturing of Perma. And as such, you were in charge, were you not, of the manufacturing effort connected with the Perma program?

MR. BENBOW: Objection.

THE COURT: I will permit it.

A I think the word "coordinate is more accurate, Mr. Grand.

Q You were not in charge of the manufacturing effort, sir?

A No. I would say that I kept Mr. Broeker aware of what was going on with relationship to the manufacturing effort. Basically decisions regarding the manufacturing program as opposed to daily administrative duties were made by Mr. Broeker.

Q Do you recall previously testifying in this matter that you were in charge of the manufacturing effort, sir?

A I think I did use that term, yes, Mr. Grand.

Q Let's see if I can refresh your recollection.

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At Page 6 of the deposition that I took in 1971 you were asked:

"According to Plaintiff's Exhibit 33-A for identification" --

MR. GRAND: Which is now Plaintiff's 63 in evidence, your Honor.

Q "-- which I will show you, you became responsible for the entire Perma product line, including marketing, production and engineering as of approximately February 17, 1965; is that an accurate statement?

"A. I think the statement is a little broader than my actual responsibility. I was in charge of the manufacturing effort and Mr. Romel, who was in charge of the engineering effort, reported to me, and so I would have general supervisory responsibility for that area. Marketing of the product was actually handled by Monitor, by a contracting arrangement, and I wouldn't say I had direct marketing responsibility."

It goes on to say, "All liaison activity with Monitor, most of it was carried out by another individual, Mr. Patten."

Do you recall giving that answer to that question?

A Generally, yes.

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Q And I gather also it was true to the best of your knowledge, belief and recollection at the time you gave it?

A That's correct.

Q Now, sir, am I also correct that Mr. Romel was in charge of the engineering effort?

A Yes, he was.

Q And he reported to you?

A Yes, he reported to me, or through me to Mr. Broeker.

Q Did he report to you, sir?

MR. BENBOW: Objection. Asked and answered.

THE COURT: What is the answer?

THE WITNESS: Yes.

Q Did you, sir, in 1965 have general supervisory responsibility for the engineering area?

A In an administrative capacity, yes. The direct supervisory responsibility was Mr. Romel's.

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THE COURT: If he knows.

A I know Mr. Morris wrote a covering letter.

Q Which, for your information, is also dated October 21, 1964?

A Right. So the covering letter was prepared the same date as the memo, and, if I recall, it was transmitted at about that time.

Q The first paragraph of your memorandum in the second sentence states:

"Because of quality problems encountered in parts supplied by outside vendors and a design deficiency in a gearbox, which was uncovered by our quality control testing procedure, only a token shipment of 500 units has been made to date. These problems appear to be resolved and shipments should resume before the end of October."

I hope you will accept from me a representation that the document does not refer or make mention of any design deficiencies other than that one in the gear box.

Do you recollect that?

A That there were no other mentions in the report?

MR. BENBOW: Objection, your Honor. The

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document speaks for itself.

THE COURT: The document does speak for itself.

MR. GRAND: I want to ask him questions about his knowledge and understanding and recollection. I know the document speaks for itself.

THE COURT: Okay.

Q Do you recollect that?

MR. BENBOW: It is a nine-page document that he wrote ten years ago, your Honor.

MR. GRAND: I am sure he has read it or it has been read to him before he got on the witness stand.

THE COURT: All right. Answer the question.

A Not really.

THE COURT: You don't?

THE WITNESS: No, if there is another mention or not. There could be. I am not really sure.

Q Am I correct, sir, that your role with respect to the Perma program between June 18, 1964 and December 21, 1964 involved keeping yourself abreast of the program, the developments in the program and the problems in the program?

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Q. Were you aware, sir, that the mold which made the cam geat was modified to accommodate a change, some change, whatever the change might have been?

A I know that there were modifications and changes, the extent of which I am not really sure of, exactly what they were.

Q But you were aware of that in October of '64?

A I was aware that they were -- work had been done on the cam gear and I was of the opinion I believe at that time that that problem had been corrected.

Q But you were also of the opinion on October 21st, sir, that the design deficiency in the gearbox had been cured, were you not?

MR. BENBOW: Objection.

THE COURT: No, I will permit it.

A Again, I knew that there was work being done on the gear box, Mr. Grand, that --

Q Let me just show you what you said about it. After the sentence that I read to you you said, "These problems appear to be resolved." This is in your memo, which is part of Defendant's 191.

On the basis of that statement I ask you, sir, did you not believe that the problem to which you

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did allude, namely, the gearbox design deficiency, had been resolved prior to October 21st?

MR. BENBOW: Objection. It says "appeared to."

THE COURT: All right.

A I say I thought that the gearbox problem had been resolved or was in the process of being resolved.

Q Nonetheless, you mention it in the memorandum?

A Yes.

MR. BENBOW: Objection.

THE COURT: Go ahead.

Q I gather with respect to the cam gear you also thought the problem had been resolved.

A I believe that's what I thought, yes.

Q But you did not mention that in the memorandum?

A I think there were a number of problems.

MR. BENBOW: Objection, your Honor.

A I didn't enumerate all of them, MR. Grand.

THE COURT: He has already answered.

Q Were you aware, sir, in October, 1964 that Mr. Romel had expressed the view that the design of the cam gear or the angle of the cam gear was of marginal design and should be changed?

MR. BENBOW: Objection.

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Q Can you tell us, sir, whether you were aware on October 21, 1964, that that problem no longer existed?

MR. BENBOW: Objection, your Honor.

THE COURT: I will permit it. Go ahead.

A Related to specific problems at this point, Mr. Grand, I am not sure. The only thing I can say is that as of the writing of that memo that I felt that it appeared that whatever problems had existed were either solved or were in the process of being solved.

Q You were aware, were you not, of an incident in which loss of brakes had been reported with respect to a vehicle equipped with the Perma Anti-skid device?

THE COURT: When, October?

Q Prior to October 21.

A Yes, I believe so.

Q And your awareness came at a meeting with Mr. Perrino?

A Yes.

Q Were others present?

A When Mr. Perrino had mentioned that a car had lost brakes?

Q Yes.

A I know that we were having a meeting, there were people at a meeting. I don't know if this was

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Q To your knowledge, did Mr. Romel ever ascertain the reason or the cause for the loss of brakes?

MR. BENBOW: Object.

THE COURT: No, I will permit it. Go ahead.

A Do I know if Mr. Romel asked him?

Q That is shorthand for saying did Romel ever tell you that he found out?

MR. BENBOW: Objection.

THE COURT: No, I will permit it.

A I don't know. Not to my recollection, no.

Q And now, you were aware, were you not, of a problem concerning O-rings prior to October 21, 1964?

A Yes.

Q And that problem had to do with the loss of hydraulic brake fluid, did it not?

MR. BENBOW: Objection.

THE COURT: No, I will permit it.

A I think it had to do with the possibility of O-rings being cut when the pressure switches were assembled. That's the way I recall the problem.

Q And you were aware, were you not, at that time that cut O-rings could lead to loss of brake fluid?

MR. BENBOW: Objection.

THE COURT: I will permit it. Go ahead,

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answer it.

A I believe that I was aware that it was a possibility, yes.

Q You were also aware, were you not, that the loss of brake fluid could lead to the loss of brakes?

A Yes.

Q And you were also aware, were you not, sir, that there was no device which would return the car to normal braking in the event of a loss of brake fluid?

MR. BENBOW: Objection.

THE COURT: I will permit it. Answer it.

THE WITNESS: Would you repeat that question?

(Question read.)

A I don't know whether I knew that or not, Mr. Grand.

Q You did know the consequence of a loss of brake fluid though, didn't you?

A Yes.

Q When you became aware of the problem with the cam gear, you were aware, were you not, that the cam gear was the heart of Mr. Perrino's fail-safe feature?

MR. BENBOW: Objection.

THE COURT: No, I will permit it.

A I don't know if I knew it was the heart of his feature or not.

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THE WITNESS: Generally, your Honor, yes.

THE COURT: All right. Were you aware of the extent of the testing that was done on these changes?

THE WITNESS: Full extent, no.

THE COURT: You were not?

THE WITNESS: No. I knew that they did some testing. The type, character, extent, I wasn't familiar with.

THE COURT: Okay.

Q Were you aware, sir, as to whether the testing of those changes had been completed prior to December 21, 1964?

A I did know that, as related to the gear box, they had accumulated many, many miles on the tests they were conducting for Mr. Perrino. I believe those tests, at least the accumulation of additional mileage, continued on until '65.

Q And is that true also with respect to the sensing unit testing?

A What type of testing?

Q Sensing unit testing.

A Sensing unit?

Q With respect to the contamination problem.

MR. BENBOW: Objection.

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A I don't recall.

THE COURT: I will permit it. Go ahead, answer it.

A I don't recall. The only one I specifically remember is the gear box.

Q Were there other recent changes as to which testing had not been completed prior to the December contract?

MR.BENBOW: Objection.

THE COURT: Overruled.

A Not that I recall, Mr. Grand.

Q This is Page 19 of your deposition I am on. I will read a couple of questions to you.

"Q. If I may interrupt you here, are you saying that all the problems that arose between June and December were solved prior to the December 21st contract?

"A. I am not sure whether they were all solved. I think we felt confident that at that time they could be solved, yes.

"Q. And some of the recent solutions, I gather, had not been fully tested by the time of the December contract?

"A. You are probably correct, yes."

MR. BENBOW: I move to strike that answer, your Honor, as speculation, if it is being offered in evidence at this point.

Q Does that refresh your recollection, sir, that you were aware of that?

THE COURT: All right, motion to strike is denied. The objection is overruled.

Go ahead, answer the question.

A I was aware that there was additional, again testing being done, such as in the case of the gear box.

Q And when you say such as in the case of the gear box, that is merely an example, is it not?

MR. BENBOW: Objection.

A No, I think what it means is --

THE COURT: If he objects, don't answer till I make a ruling, okay?

Now, go ahead and answer it.

A I think what it means is that at that time I felt that the problems had been resolved, that we had known solution.

THE COURT: The problem is, Mr. Grand asked you about testing.

A The only testing that I recall that was still ongoing as of December 21st that I recall was the gear box;

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again, accumulation of additional mileage or the running of the gear box until eventual failure.

Q Let me see if I can refresh your recollection on that subject, sir.

"And were there" --

THE COURT: Page?

MR. GRAND: Sorry. Page 26.

Let me withdraw the question.

Q You were aware, were you not, that there were changes taking place right up into December 1964 with respect to the gear box, sensing unit, pressure switches, adaptors and brackets?

MR. BENBOW: Objection.

THE COURT: No, I will permit it. Answer the question.

A I knew that there were changes being made all during this period, Mr. Grand. Specifically whether they covered all of those items or some of those items, I can't recall now.

Q Let me read to you from Page 26 of your deposition, Line 17:

"Q. And were there changes and design changes being made right up through the period prior to December 21, 1964?

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"A. Yes, there were.

"Q. Among the design changes were design problems that you encountered, were design problems with the gear boxes, were there not?

"A. Yes.

"Q. And with the sensing unit?

"A. Yes, pressure switches, adaptors, brackets, quite a few all through.

"Q. Those changes were taking place right into December 1964, were they not?

"A. Yes."

Does that refresh your recollection?

MR. BENBOW: Objection.

THE COURT: No, I will permit it.

A No, not at this point, no, not really.

Q All right. I gather, though, you stand by the testimony that you previously gave in this matter?

A Yes, I do.

Q Now, I believe you have testified that after the preparation of the October 21 memorandum by you, which is part of Defendant's 191, you met with some of the executives in New York, one of whom was Mr. Hough.

A Yes.

Q And am I correct that you met with Mr. Hough

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Q You participated, didyou not, in the negotiations of the technical services contract?

A Yes.

Q And am I correct, sir, that you anticipated receiving engineering services during the year 1965 from a source other than Perma exclusively?

MR. BENBOW: Objection.

THE COURT: No, I will permit it. Go ahead.

A I am not sure whether I understand that, Mr. Grand. Other than Perma exclusively?

Q Let me withdraw it. In connection with your negotiation of the technical services contract you anticipated that Singer would be receiving from Perma certain engineering services in the year 1965, is that correct?

A Yes.

Q Am I also correct that you anticipated that there sould be engineering services provided by others, namely, the Singer engineering staff?

A You mean internally?

Q Sure.

A Yes.

Q And you anticipated, did you not, that the

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Singer engineering staff would be engaged in providing design changes to the device and improvements to the product?

MR. BENBOW: Objection.

THE COURT: No, I will permit. Go ahead.

A I expected they would be making improvements, cost improvements, manufacturing changes, things of that nature

Q Let me see if I can refresh your recollection as to the nature of the changes. Page 49 of the deposition taken in 1971. This is line 14:

"Q The contract specifically calls for, does it not, the assistance of Perma in the 'continuing design and engineering improvement of the product,' and I am pointing to the language that says that?

"A Then that would sum it up, I think.

"Q In other words, you anticipated there would be continuing design changes and improvement in the product at the time the contract was entered into?

"A And specifically with the Perma anti-skid device?

"A Right.

"Q To get the kind of assistance that would be needed you would be prepared to pay over $9000 a

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month to Perma, correct?

"A Yes, in part. That wasn't the only source that we were relying on.

"Q What other --

"A Our own engineering staff.

"Q Certainly. I didn't mean to suggest otherwise.

"A Okay."

Does that refresh your recollection on the subject?

MR. BENBOW: Objection.

THE COURT: No, I will permit it.

A Yes, that's the way I would describe it.

Q At page 6071 of the trial transcript here you testified about a conversation with Sam Karp in September of 1964. Starting at line 16:

"Mr. Karp had stated that he thought that Perma would be better off if Singer got more deeply involved and probably even took over the Perma program."

Then on the top of the next page you say:

"He had indicated they were having problems."

Do you recall anything else about that conversation with Mr. Karp?

A You mean with Mr. Karp?

Let me withdraw it. I will make it easier.

I gather you saw Mr. Murphy in possession of a copy.

MR. BENBOW: Objection, your Honor.

THE COURT: Is that a question?

MR. GRAND: Yes.

THE COURT: I gather you saw Mr. Murphy, is that correct? Then the objection. The objection is overruled.

A I don't recall whether I saw him with a copy or not. My recollection at this point seems to be that he did have a copy or did get a copy.

Q Did you discuss the report with Mr. Patten and Mr. Broeker?

A Yes.

Q Was the report presented in some fashion?

A This document?

Q That's correct, Plaintiff's 57.

A No, it wasn't.

Q Did you and Patten and Broeker and Murphy discuss it at a meeting?

MR. BENBOW: Objection.

THE COURT: No, I will permit it.

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A. We discussed it. Whether you characterize it as a meeting or not, I don't know.

Q Let me see if I can refresh your recollection on the subject of whether or not the report was "presented." Page 29 of the deposition that I took in 1971. Accept from me, if you will, that I am talking about the Hill report. On 16:

"Q Do you recall discussing that portion of the report with anyone at the time you received the report?

"A No. Actually, the whole report was presented, I believe, at a session with myself and some other Singer people."

Does that refresh your recollection, sir, that the report was presented at a session with yourself and other Singer people?

A The only presentation that I recall or that was made, I believe, by William E. Hill, who would be the presenter, was at a meeting in early November.

Q That is something different, that is a verbal one?

A Right.

Q Let me go on. This is continuing on line 22:

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"Q Do you recall who else received copies of the report or who else was present at the presentation?

"A I believe it was Mr. Murphy and Mr. Broeker. I don't know who else was there. I believe it was those gentlemen, anyway. And William E. Hill people presented this report and it was discusssed and the details I don't recollect at this time."

Does that refresh your recollection that the report itself was presented and was the subject of a discussion at a meeting?

A No, it doesn't. I know I received it. I don't recall that -- I don't believe there was a presentation. That's not the way my recollection goes at this point, at least not in December.

Q Once again, though your recollection may be different today, what I just read to you from pages 29 and 30 of the 1971 deposition represented your best recollection at that time, did it not?

A I guess so, yes.

THE COURT: Let's take our break.

(Recess.)

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BY MR. GRAND:

Q Plaintiff's Exhibit 57, Mr. Kloby, is a Xerox copy. It has a number --

THE COURT: Xerox copy of the Hill report.

MR. GRAND: I'm sorry.

Q It has a number of underlinings in it. They appear to be underlinings that were made with the benefit of a ruler because they are quite straight.

Can you tell me,sir, who put those underlinings on the document?

A No, I can't.

Q Do you know, sir, if you put the underlinings on the document?

A No, I didn't put them on there.

Q I believe you testified this morning that after receiving the Hill report and transmitting it to Patten and Broeker you discussed it with those gentlemen.

A Yes, sir.

Q The second sentence of the Hill report itself, that is, the second sentence of the second page, reads:

"Although determination of sales potential was the principal objective, the issue of product performance arose during the course of the project as an important consideration and the subject has been

covered in the report."

Did you, sir, in your discussions with Patten and Broeker discuss product performance?

A We went through the whole report, including the appendix.

Q Page by page?

A Probably for the most part, yes.

MR. GRAND: I think that will shortcut a number of things I had to ask.

Q On Page 2, that is, Arabic 2 of the document, there is the statement, under Arabic 2, a, Arabic 1:

"The test results of the Motor Vehicle Research Group, which were sponsored by Perma, showed that under all road conditions use of the Perma anti-skid control allowed the car to stop significantly faster than under locked wheel conditions."

Did you and these other gentlemen discuss that aspect of the report, namely, the reference to the fact that the motor research tests were "sponsored by Perma"?

A Not specifically. We considered it independent. I don't know --

Q I am asking you if you discussed that. I am not asking what you considered. I am asking you if you

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Does that refresh your recollection on this subject?

MR. BENBOW: Objection.

THE COURT: No, I will permit it.

A Mr. Grand, when you asked me did I think the device should be reliable I answered yes. I didn't intend in my answer that by meaning it should be reliable that it should be mutually exclusive of being safe. I felt it should be safe as well as reliable.

Q Fine, if that is the only dispute we have.

When, sir, did you begin to focus on the need for a fail-safe feature for the device?

MR. BENBOW: Objection.

THE COURT: No, I will permit it.

A When did I or when did our engineering people? Specifically, what do you mean?

Q Let's start with you.

A When did I?

Q Yes.

A I think I would say in the early part of '65.

Q How about the latter part of '65? Would that be more accurate?

MR. BENBOW: Objection.

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A. No, it wouldn't. I think I was calling it fail-safe in the latter part of '65.

Q But you had it in mind in the early part of '65?

A Yes.

Q By "had it in mind" do you mean simply that others had raised the question of whether the device was fail-safe in early 1965?

MR. BENBOW: Objection.

THE COURT: No, I will permit it. Go ahead.

A No. In early 1965 I believe our engineering people were working on that problem, problems related to fail-safe.

Q Let's talk about that. In early 1965 Monitor had called to your attention questions about whether the device was fail-safe, is that correct? Specifically, March.

A I don't recall the specific reference by month. You would have to refresh me on that one.

Q Do you remember a so-called du Pont evaluation?

A Yes, I do.

Q Did that also raise questions as to whether

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AFTERNOON SESSION

1:15 p.m.

R O B E R T A . K L O B Y , resumed.

CROSS-EXAMINATION

BY MR. GRAND: (continued.)

Q Before I go on, Mr. Kloby, I want to go back to something that we were talking about this morning, particularly the consequences of a leak through an O-ring or the consequences of the loss of hydraulic fluid and ask you, sir, whether you knew prior to December 21, 1964 that the the Perma anti-skid device was not fail-safe.

MR. BENBOW: I object, your Honor.

THE COURT: No, I will permit it.

A At any time or prior to the contract I thought it was fail-safe?

Q Prior to December 21.

A Prior to signing the contract, I thought it was fail-safe.

Q And now, let me see if I can refresh your recollection on that subject. Page 311 of the transcript of the deposition, taken in 1971, reads as follows:

"Q. So long as there was a potential problem or a potential failure which would take place in the O-rings, the device could not be fail-safe, could it, by

your definition?

"A. That's right.

"Q. You knew prior to the December contract, did you not, of the existence and the potential problem that could arise with O-rings, is that correct?

"A. I must have been conscious of it, yes.

"Q. So that prior to the December contract, you knew that by your own definition the device was not fail-safe, did you not?

"A. I don't believe I thought of it in those terms, but I think I'd have to say you are correct, yes."

Do you recall that testimony?

A Yes, I do recall the testimony.

Q And was that testimony true and accurate when you gave it? Yes or no?

A I thought what you meant when --

Q No, was the testimony true and accurate when you gave it, sir?

A No, I don't think -- as I understood it,it was accurate, yes.

Q As you understood it, when the questions were being asked and you gave the answers?

A That's right, Mr. Grand.

Q And today you do not believe that the testimony

is accurate?

A Today, as then, Mr. Grand, I believe that the unit was fail-safe when that contract was signed on December 21st. I thought what you were asking then -- and there seems to be some confusion in my mind about what you were asking at the time -- is that you had asked me in 1965 was I aware that a leak could cause a failure and I was.

Q 1965?

A '65.

Q The questions, you will recall, from what I just read, were directed to prior to the December contract, is that not true?

A I thought what you were asking them was based on my knowledge in '65, looking back, did I think if that condition existed, was the unit fail-safe. As far as the O-rings go, I thought that problem had been solved in '64.

Q Let me read the question to you:

"Q. So that prior to the December contract you knew that by your own definition the device was not fail-safe, did you not?

"A. I don't believe I thought of it in those terms, but I think I'd have to say you are correct, yes."

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Was that answer truthful when you gave it?

A In '65 I knew, yes. By my definition, I thought in '65 -- I knew in '65 that it was not fail-safe in '64.

Q But you didn't know in '64?

A I didn't know in '64, no.

Q And you were confused by the question?

A I believe I was.

Q You didn't state during the interrogation in the deposition that you were confused, did you, Mr. Kloby?

A No, I didn't.

MR. BENBOW: Your Honor, I think it is fair to point out that "prior to the December contract," about which he is being asked, is vague and the questions didn't go to the question of when prior to the December contract.

Q I want to call your attention, Mr. Kloby, to Plaintiff's Exhibit 94, which is in evidence. Mr. Benbow asked you about it yesterday. The covering document is a letter or a memo from Mr. Broeker to Mr. Person. dated September 1, 1965, subject, anti-skid control.

The subject matter is fail-safe features.

The second page of the document is a memo from

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Q During 1965, Mr. Kloby, did Singer have in inventory some 50,000 sensing units?

A Approximately that, yes.

Q Approximately $900,000 worth of inventory?

A Approximately, yes.

Q Was it your understanding, sir, that you were to do all within your power to salvage that inventory?

MR. BENBOW: Objection.

THE COURT: Did anyone so instruct you?

THE WITNESS: To do all within my power to salvage the inventory? No.

Q Was it your understanding, sir, that the existence of that 50,000 units in inventory restricted your freedom of design to solve the problems as they arose?

THE COURT: No, I will permit it.

A Existence of the inventory certainly was a business consideration, yes.

Q Will you answer my question?

A Restricted? No.

Q Page 238 of your deposition in 1972, sir:

"Q Was it your understanding that the existence of the 50,000 units in inventory restricted your frame" -- it should read "freedom" -- "of design

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to solve problems as they arose?

"A As a practical matter, I believe so, yes."

Do you recall that testimony?

A Vabuely, yes.

Q And it was true to the best of your ability to make it so at the time you gave it?

A Yes.

Q Now, sir, you testified yesterday about some kind of a technical liaison with Kelsey-Hayes in the spring of '65. Do you recall that?

A Spring of '65?

Q Yes. Around March of 1965 Romel went out to Kelsey?

A Yes, yes.

Q Was Kelsey-Hayes paid anything for whatever services they rendered to Singer?

A Not to my knowledge, no.

Q Now, sir, are you aware of an evaluation by Kelsey-Hayes of the Perma anti-skid device in early 1966?

A Yes, I was aware that an evaluation was withdrawn. In fact, I think -- well, yes, I think I was aware of it, right.

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Q At any time prior to the December contract did you believe that the O ring problem had been solved?

A Yes, I did.

Q In other words, as of December 21, 1964 you no longer believed that O rings were a problem with the device?

A That's correct.

any of these patents?

THE WITNESS: Yes, a number of them.

Q How many of your patents relate to anti-skid devices or modulators or parts of anti-skid devices?

A The list which you showed me yesterday includes four patents relating to some form of anti-skid modulator and I believe there is one patent application listed which may have matured into a patent in the meantime.

Q Relating to modulators?

A Relating to modulators.

Q Are any of those five inventions utilized in connection with the Bendix anti-skid device?

A I don't believe so.

Q Are any of them in commercial production?

A I don't think so. At least, not in the form shown in the patent applications.

Q Can you tell us when the Bendix system was brought to market?

A I believe it was available on the 1970 model of the Chrysler Imperial.

Q Do you know when it was sold to Chrysler?

MR. LAGEMANN: Could I have that question read back? I didn't hear it.

THE COURT: Sure.

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(Question read.)

MR. LAGEMANN: I object to the question for lack of foundation, in addition to not understanding it.

THE COURT: I understand it.

Was it sold to Chrysler?

THE WITNESS: Yes, it was sold to Chrysler.

THE COURT: Do you know when that happened?

THE WITNESS: I don't really know how you define the precise point at which something is sold. Certainly at one time or another Chrysler presented Bendix with a purchase order. The actual selling may have occurred substantially before a purchase order matured and I wouldn't know --

THE COURT: You had nothing to do with it.

THE WITNESS: I wouldn't have known it in any case.

Q Did you have any contacts with Chrysler Corporation concerning the Bendix anti-skid system?

A No, I did not.

Q Was the Bendix anti-skid system also sold to International Harvester?

A Yes, it was.

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Q Do you know when that took place?

MR. LAGEMANN: Objection, your Honor.

THE COURT: I gather, sir, that you had nothing to do with selling the system in any shape, manner or form to anybody, is that right?

THE WITNESS: Yes, did have something to do with selling the system, but the areas in which I worked we weren't successful.

THE COURT: Okay. So you don't know when it was sold to International Harvester?

THE WITNESS: Well, I think again it was a available either in 1970 or '71 vehicles. I think -- you see, this is after my employment with Bendix, so I am a little hazy.

But Mr. Suttle concentrated on the sales activity. And, incidentally, Bendix engineers do take a great deal -- perform a great deal of the function of selling the devices because we are selling an engineering product to engineers. Really that's where it is sold.

THE COURT: Okay.

THE WITNESS: Mr. Suttle concentrated on Chrysler --

THE COURT: The question was do you know when

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February of 1974. But it was during the period when we had the long recess.

Q Was that the first occasion that you drove cars equipped with the General Motors and Ford anti-skid devices?

MR. LAGEMANN: Objection. The question is too broad. Maybe it can be broken down.

THE COURT: All right. Let's try General Motors first.

A It was the first occasion that I had driven the General Motors anti-skid equipment.

THE COURT: How about Ford?

A It was not the first occasion I had driven Ford.

Q When was the first occasion that you drove the Ford anti-skid system or drove a vehicle equipped with the Ford anti-skid system?

A It was a few months prior to my leaving the Bendix employment, when we acquired the Lincoln automobile -- it was actually a Mark III -- equipped with the Kelsey-Hayes anti-skid system.

Q Were there any occasions between that time and February 13, 1974?

A No.

Q Do you know when the General Motors device be-

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came commercially available?

A I believe in 1971 Cadillacs, Eldorados, and Toronados.

Q Who paid for that testing?

A Who paid for --

MR. LAGEMANN: I am sorry. I didn't hear the question.

THE COURT: I didn't hear it either.

Q Who paid for the tests on February 13, 1974?

A The Singer Corporation.

Q You testified I believe yesterday that you tested the Teldix system, is that correct?

A Yes.

Q And when you tested the Teldix system did you use an 18-channel oscilloscope?

A If I said scope I meant graph.

Q You did use an 18-channel oscillograph?

A Yes.

Q Did you use an 18-channel oscillograph for any particular reason?

A The Teldix system was an individual, four-wheel control, and we used 18 channels because it required that to get all of the information onto the tape. That only provided us with four channels for each wheel system

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The first assumption is some reason to change it, that is, there is something wrong --

THE COURT: I understand that. No, I will permit it.

A Anyone responsible for converting the Perma-Vac to a rolling diaphragm configuration would have been faced with the same problems that we had at Bendix and probably would have required the same three-year period to perfect a design.

THE COURT: How about if the chief engineer is a guy who when asked the difference or the proportion between the two different surface areas of a circle, and is given the two different equations, Pi r squared and also Pi d squared over 2, and is told that he doesn't have to care about Pi, that the answer ought to be between this and that, and he takes 22 minutes to do it, and by the way, gets all four answers wrong? Do you think it might take longer?

THE WITNESS: There is a certain subjective problem there.

THE COURT: Do you think it might take longer?

THE WITNESS: Possibly. From what you said, yes, I would say it would.

MR. DE RENSIS: Your Honor, in that last answer

THE COURT: I agree, but we are going a long way down the trip of probability on it.

THE WITNESS: The one reason I make that assumption is that I believe that one of the field reports describes it happening precisely like this.

MR. DE RENSIS: Your HOnor, those field reports were not in for the truth of the contents, but because they were received by Singer at some point and received by Perma,

THE COURT: He is talking about possibilities.

Tell me, Mr. MacDuff, in any of the Bendix Chrysler things, did you ever find a mis-wiring in the logic unit?

THE WITNESS: I never found any.

THE COURT: Did anybody?

THE WITNESS: This is what manufacturing final production test procedures are supposed to eliminate.

THE COURT: But is it possible? Is it possible? Yes or no?

THE WITNESS: Sure, it's possible.

THE COURT: Okay. What happens if it is mis-wired?

THE WITNESS: There might be some kind of malfunction.

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THE COURT: And that malfunction is caused by mis-manufacture, isn't that correct? Yes or no?

THE WITNESS: Yes.

THE COURT: If the thing is not made right, it is not going to work.

THE WITNESS: Nothing is perfect.

THE COURT: That, believe it or not, is one of the most important bits of testimony you have given.

Go ahead.

Q Mr. MacDuff, if there were,however, a mis-wiring in the Chrysler logic and control module, that would affect the logical sequence or logical processees in that module, what would happen?

MR. DE RENSIS: Your Honor, I object.

THE COURT: Sustained. You forget the one thing that he disclaimed any expertise in is electronics, and that's just the area you are talking about.

MR. LAGEMANN: On the other hand,your Honor, if you would like me to develop it further, I can , but Mr. MacDuff has stated that he has worked with these devices, he knows --

THE COURT: I am aware of that. I was here.

MR. LAGEMANN: Your Honor, if I may, let me finish.

MR. GRAND: Your Honor, another preliminary matter. I assume that before you rule or comment on the Kelsey-Hayes letter, at a time convenient to your Honor, you will ask my comments.

THE COURT: Sure. Do it right now.

MR. GRAND: All right. I am vigorously opposed to the calling of Mr. Every under the terms that are set forth in this document, Defendant's 684 for identification. Initially, before I get to the document itself, I think that the calling of Mr. Every in an attempt to qualify Defendant's 335, tests or evaluations of some Perma-related device, which were conducted in February of 1966, are completely irrelevant.

First of all, they were conducted after all of the personnel on the Singer project had been removed from the project. They were conducted, your Honor will recall, without any payment being made to Kelsey-Hayes. They were conducted at a time when litigation was in formation, had been announced between the parties and was approximately one month away from commencement.

They were also conducted at a time when Kelsey-Hayes was already involved in a relationship with Hydra-air and possibly also with Ford Corporation, so that I don't think, whatever they will show, it would be probative of anything relevant to this case. But perhaps as significant as my general objections to the admission of that document under any terms are my objections to the proposed witness who will come to us in, according to this document, so emasculated form that cross-examination of him would be impossible.

I have objections which go to each and every one of the sub-paragraphs.

If Mr. Every is to be permitted to testify, we are not to be permitted to cross-examine him with respect to any test procedure, any tests or any test results on any system tested by Kelsey-Hayes other than the Perma anti-skid system. Who knows? I think it would be most probative for the Court to know, for example, that at the time the Perma system was rejected, they also rejected other systems which have now been marketed. For example, that might be probative to their motives and the kind of test results that they were capable of obtaining and the kind of results they were prejudiced to obtain in the first place.

The second paragraph would preclude us from questioning whether the Kelsey-Hayes system has characteristics, the existence of which led to their rejection of the Perma system.

The third category would preclude us from examining the business relationships existing between Kelsey and its customers, for example, Ford Motor Company, and the extent to which that business relationship had already reached such a level as to preclude the serious, unbiased and independent consideration of any other device.

The fourth category which would preclude examination on any information or any development, testing or consulting or design activity Kelsey-Hayes has done would preclude us from examining the degree of commitment between Kelsey-Hayes and Ford, Kelsey-Hayes and Hydra-air, without which it seems to me we would be precluded from engaging in meaningful cross-examination to determine the circumstances and worth of the report being offered.

THE COURT: Do you want to be heard?

MR. LAGEMANN: Yes.

Needless to say, we disagree with most if not all of Mr. Grand's contentions.

To begin with, it is our position that Kelsey-Hayes

evaluation of the Perma device was, if anything, a totally independent, unbiased, non-party evaluation of the device, in the most relevant period to this litigation.

The fact that there was no payment, it seems to me, is highly indicative of this fact. This is total non-bias on Kelsey-Hayes' part.

The fact that these tests were conducted at a period when the litigation was perhaps building up between Perma and Singer, it seems quite irrelevant to Kelsey-Hayes' evaluation of the device.

THE COURT: Do you really mean that?

MR. LAGEMANN: Yes, your Honor.

THE COURT: Go ahead.

MR. LAGEMANN: Kelsey-Hayes isn't a party to this litigation and it wasn't a proposed or projected party to litigation at that point in time. If Kelsey-Hayes had any interest in this device whatsoever, it was to perhaps purchase it.

Incidentally, Mr. Grand's statements with relation to Kelsey-Hayes being involved with Hydra-air at this point in time, I believe to be untrue and totally unsupported statements by Mr. Grand.

I don't think that we can make this assumption.

MR. GRAND: Dan Goor testified to it, I think.

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MR. LAGEMANN: I don't recall that he did.

THE COURT: All right, go ahead.

MR. LAGEMANN: Similarly, the testimony with respect to Kelsey-Hayes' rejecting other systems at this point in time, I have reason to believe, is untrue as well.

Basically, your Honor, Defendant's Exhibit 335, we submit, is a business record, prepared by the Kelsey-Hayes Company in the normal course of its business, as an automotive supplier. The record itself, Mr. Every, I believe, will testify, was performed at the direction of his superiors in his company and the report was prepared in the normal course.

Essentially, what we propose to do with Mr. Every is to establish the fact that this is a business record, establishes qualifications up to that point in time to make the type of evaluation that is contained in Defendant's Exhibit 335. We don't believe that the limitations which have been placed on the questioning of Mr. Every by Kelsey-Hayes in Defendant's Exhibit 684 go to the manner or fashion in which Defendant's Exhibit 335 is being offered.

THE COURT: I have no intention of restricting the cross-examination of Mr. Every should he be produced

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in any way, shape, manner or form.

MR. LAGEMANN: In other words, your Honor, you are saying --

THE COURT: I will not accept limitations imposed on some witness as to what he is going to testify to and what he is not, be that that witness or his counsel or the corporate counsel. If he is going to come in and testify, he is going to go the whole route.

time. If they had performance and other criteria for anti-skid I think it is highly irrelevant.

THE COURT: Yes, but he said they changed it as they went along, finally they all drifted together. What difference does it make whether they had it?

Q Mr. MacDuff, in the 1965 period were there common although unpublished criteria relating to anti-skid devices?

MR. DE RENSIS: I object.

THE COURT: I don't even know what it means.

MR. DE RENSIS: I think it conflicts with what this witness has just testified about.

THE COURT: I will sustain the objection.

Q During the period in which you were attempting to sell anti-skid to automobile manufacturers did you find that the various companies that you visited had common criteria?

MR. DE RENSIS: I object.

THE COURT: Sustained.

Q Mr. MacDuff, in 1965 were there commonly accepted anti-skid criteria in the automotive industry?

THE COURT: I don't know what this means.

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I will permit it. It's going to be another inconsistency. We are chock full already. Go ahead.

A Everybody who was looking at anti-skid -- yes, there were engineering requirements of anti-skid systems which, if you want to use the word "criteria," were fundamental to the problem. In other words, an anti-skid system must perform a certain functin and actually the numbers which are set forth in criteria may vary a little bit, but essentially if you meet say a low-speed operation of five miles an hour to someone's criteria and seven miles an hour to the other the two systems probably don't differ in any real sense, but all of the systems must perform a useful anti-skid function and they should be designed, and all the engineers that I have ever had anything -- contact with in my own efforts --

MR. DE BENSIS: Your Honor --

MR. LAGEMANN: The witness should be permitted to finish his answer.

MR. DE BENSIS: He has gone so far afield. I thought the question was 1965. This is before even Bendix started its anti-skid program. There has been no foundation laid for this. Now he is talking about talking with other engineers.

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BY MR. LAGEMANN:

Q Mr. MacDuff, in 1968, were you aware of the general criteria that the automotive industry required of anti-skids?

A Yes, I was.

MR. DE RENSIS: Objection.

THE COURT: No, he is aware of it. I will permit it.

Q And how were you aware of the general standards in the automotive industry?

A Through my contacts with the people in the industry who were involved in anti-skid projects.

Q Specifically, Mr. MacDuff --

A And in our own project, I assisted in the writing of a Bendix engineering specification for anti-skid systems which included operational criteria.

Q Mr. MacDuff, were you aware in 1968 and 1969 of General Motors anti-skid criteria?

A In a very general way.

Q And how did you become aware of those criteria?

A Well, through contacts with people at the General Motors Research Division.

Q Were you aware of Ford's criteria for anti-skid?

A Again, yes.

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impose a steerability criterion on a system controlling only the rear wheels.

Q Mr. MacDuff as of 1965 or 1966, would an anti-skid device have to meet certain performance criteria in order to be marketed?

MR. DE RENSIS: I object . I would be happy to expand, your Honor.

THE COURT: Go ahead, expand.

MR. DE RENSIS: The objection is, first of all, we don't know where it is being marketed, what is being marketed, whether it is being marketed in the OEM market or in the after-market.

Secondly, this man is not qualified, I don't believe, to talk about marketing in 1965 and 1966, (a) because he wasn't involved in marketing any anti-skid devices at that period of time, and (b) all his knowledge is based on events that took place in '69 or '68.

We also don't know whose performance criteria we are talking about, Bendix' --

THE COURT: I was wondering whether you were going to get around to that. Sustained. Reframe the question.

Q Mr. MacDuff, in 1968, were there general criteria in the automotive industry which were generally

accepted in the automotive industry relating to anti-skid performance?

MR. DE RENSIS: I object.

A Yes.

THE COURT: The answer is yes. Go ahead.

Q In your opinion, would an anti-skid device which was marketed in 1965 or 1966 have to meet these same criteria?

MR. DE RENSIS: I object to that. In fact, I think that the device --

THE COURT: It is getting into the realm of pure speculation, Mr. Lagemann.

Did you have performance criteria in 1964, '65, for an anti-skid device?

THE WITNESS: No, but there was no anti-skid device in 1964 except the Perma -- well, I had the performance criteria from the standpoint that the last time I evaluated --

THE COURT: Theoretical.

THE WITNESS: It was theoretical, and it was based on the same kind of knowledge of physics and mechanics that enabled Mr. DeVilliers to set up his --

THE COURT: His model?

THE WITNESS: His model.

THE WITNESS: The majority of the engineering effort which we would have captured, and it would have been reflected in our books of account as manufacturing period costs, were engineering research and development efforts.

MR. GRAND: I object to that.

THE COURT: I'm not even sure I understand the answer.

MR. GRAND: Move to strike it.

THE COURT: Let me find out if I understand it first, and then I'll decide whether to strike it or not.

When you say majority of the manufacturing effort which we would have captured, what do you mean by that?

THE WITNESS: The manufacturing engineering, the engineering effort, the salaries and wages of engineers specifically assigned to the Perma anti-skid device in 1965, their efforts were expended in research and development.

MR. GRAND: How does he know that?

THE COURT: Go ahead. Yes?

THE WITNESS: And those expenses were listed as manufacturing period costs.

THE COURT: In other words, the engineers who

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were working on the project in 1965 at the Elizabeth plant --

THE WITNESS: That's correct.

THE COURT: -- were all carried as manufacturing period costs?

THE WITNESS: Absolutely.

THE COURT: And those engineers are all listed on the document in front of you, which is Defendant's 686 for identification?

THE WITNESS: Yes.

THE COURT: All right.

Q Are any of these other expenses attributable to research and development?

MR. GRAND: I object to this. We haven't got one iota of foundation for research and development. She is afraid to ask the question directly. I move to strike any reference by counsel or by this witness. All we have got so far is a bunch of engineers engaging in something which ends up on a manufacturing line.

THE COURT: Don't get excited.

Any place else in the books and records of the corporation which indicates that research was done on the Perma system during the year 1965?

THE WITNESS: Yes.

THE COURT: What was that?

THE WITNESS: The Elizabeth factory received a charge from the Denville Laboratory in the amount of $13,354.

THE COURT: Is that reflected on this document?

THE WITNESS: Yes, it is.

the entire trial.

MR. GRAND: I don't understand why the objection is sustained.

THE COURT: These are Singer documents.

MR. GRAND: Yes.

THE COURT: Where did you get them?

MR. GRAND: I got them from them in the course of the production of documents in the course of this case.

THE COURT: On Defendant's Exhibit 686 you have described Mr. Nester or N. Hnojowy as a QC engineer, is that correct?

THE WITNESS: That's correct.

THE COURT: Do you know if he is an engineer of any type at all, a graduate of an engineering course in college?

THE WITNESS: I am not familiar with his educational background.

THE COURT: Of any type?

THE WITNESS: No.

THE COURT: So it is possible he is not an engineer.

THE WITNESS: It is possible that he is not an engineer, that's true.

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THE COURT: Mr. Frank Gessner. F. Gessner, Sr., is referred to here as a mechanical engineer in 686, is that correct?

THE WITNESS: That's true.

THE COURT: Do you know if he is a graduate engineer?

THE WITNESS: I do not.

THE COURT: Mr. W. Guiseppi is called a plastics engineer. Do you know if he went any farther than high school?

THE WITNESS: I do not know.

THE COURT: You don't know anything about these people, is that it?

THE WITNESS: The information -- I do know that the information that is reflected here are job titles which are on their personnel records associated with their salaries, and to that extent, that's the title given to them.

THE COURT: This is just a job title?

THE WITNESS: It's the job title that they were performing.

THE COURT: Do youhave classification numbers.

THE WITNESS: In our personnel records?

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THE COURT: Yes.

THE WITNESS: Yes, we do.

THE COURT: So you could have put down numbers there instead of these engineering titles which are made up by your personnel group, is that right? Yes or no.

THE WITNESS: No, I don't know that we had job classifications at that time.

THE COURT: You don't know if you had job classifications at that time?

THE WITNESS: In terms of -- excuse me, your Honor. Precisely what classifications are you referring to?

THE COURT: Job classifications. In personnel terms --

THE WITNESS: Yes, we do have --

THE COURT: You had them at that time too, didn't you.

THE WITNESS: Yes.

THE COURT: So you could have put down numbers there instead of these names?

THE WITNESS: That's true.

THE COURT: These names are strictly personnel names and they don't indicate anything, right?

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THE WITNESS: Well, they are --

THE COURT: They are personnel --

THE WITNESS: Personnel.

THE COURT: You didn't make them up?

THE WITNESS: No, I didn't make them up.

THE COURT: And you could have put down numbers?

THE WITNESS: I could have put down numbers.

THE COURT: Why did you put down these things?

THE WITNESS: This was the information that was available, that was obvious to me.

THE COURT: You are a man who is interested in numbers, aren't you?

THE WITNESS: Yes.

THE COURT: And you had numbers, so you could have put them down there, right?

THE WITNESS: That's true, I could have put them down, but I just inadvertently -- I should have, as an afterthought.

THE COURT: I don't see the necessity for this document at all.

MR. GRAND: I think, your Honor, I am en-

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directing my questions to facts up to and including December 21, 1964, the date of the second contract with Perma.

Q Are you an employee of the Singer Company at this time?

A No, I am not.

THE COURT: You were an employee though at one time, weren't you?

THE WITNESS: Yes, sir.

THE COURT: And you were vice president of the same corporation at one time, weren't you?

THE WITNESS: I was vice president of manufacturing.

THE COURT: How long was that, sir?

THE WITNESS: From the latter part of 1958 until I left the company in 1966.

THE COURT: Okay.

Q Could you briefly describe your educational background, Mr. Hough?

A After I completed high school I went to the Massachusetts Institute of Technology and graduated from there in 1938 with a bachelor's degree and a master's degree in mechanical engineering.

Q In 1938 did you commence working with the

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Q Would you tell us in substance what was said at this time?

MR. GRAND: I object to this.

THE COURT: Yes. Tell us who said what to whom, as best you can.

A I raised a number of questions with Mr. Perrino about the anti-skid device, what the history of it was, how it worked. I am not sure I understood how it worked at that point in time. He explained to me how it worked, he explained what the history had been, that it was not a new device, that it had been on the market for several years, and I don't remember for sure, but I think he said there were as many as 5000 units out in the field. He referred to some tests that had been made by somebody in New England, some motor vehicle group, and he mentioned the fact that there was some interest, not very specific, but some interest in the part of some of the automotive people.

Q Do you recall anything further that was said by Mr. Perrino at this meeting or by yourself?

A Well, I think he explained that whereas

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it was a going unit, he was not satisfied with his then source of supply. That was the reason that he was interested in Singer taking over the manufacture of this product.

A Yes, I did.

Q Let me direct your attention to the period between June 18, 1964 and up to September, 1964 and ask what, if anything, you did with respect to the Perma project during this time.

A I kept myself fully informed of what was happening on the project. I did this through Mr. Murphy and through Mr. Morris. I was interested in --

MR. GRAND: Object to what he was interested in.

THE COURT: Sustained. What did you do? Not what you were interested in. What did you do?

THE WITNESS: Oh.

A Well, I asked them for reports on shipments, production, and as it turned out, we ran into a lot of problems with the inventory that were picked up --

MR. GRAND: I object to this.

THE COURT: Sustained. They made reports to you as to what was going on between June and September, is that correct?

THE WITNESS: Yes, sir.

THE COURT: Did you deal directly with the Perma people during this period?

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ever analyze the device?

THE WITNESS: Personally?

THE COURT: Yes.

THE WITNESS: I have had it explained to me, but I never got into the real nittygritty of it. I had a good idea of how the thing worked, the concept of it, and I had problems pointed out to me.

THE COURT: Okay.

Q Did you ask the people at Elizabeth to report to you on component and other problems with the device?

A Yes.

Q And did you receive reports concerning problems with the device during this time period?

A Yes.

Q Did you receive such reports on more than one occasion?

A Yes, I did.

Q Could you give us an estimate of how many discussions you had with Singer representatives during the period June 18, 1964 through September, 1964 concerning the Perma device?

A I would be making a guess. It is probably six or eight discussions.

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Q Subsequent to your discussion with Mr. Murphy concerning Defendant's Exhibit 191 what did you do next with respect to the Perma project?

A Well, it seemed to me there was a period of time we

MR. GRAND: I object to this. He was asked what he did.

THE COURT: He is trying to recollect.

MR. GRAND: I would like him to recollect to himself and then tell us what he did, if I may, your Honor.

THE COURT: All right. This man is an engineer and not a lawyer. I will take it the way it comes go ahead.

A I convened a meeting at Elizabethport early in December for a review of the whole Perma situation and at that meeting I raised many questions about the project and I was satisfied then --

MR. HRAND: I object and I move to strike. He convened a meeting and that should be where it stops.

THE COURT: You raised questions?

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THE WITNESS: All right.

THE COURT: What you were satisfied with, your personal interior feelings, we are not getting into.

A I was told that --

MR. GRAND: I object to what he was told.

THE COURT: Let's hear it.

MR. GRAND: We are now going to get all the Romel testimony.

THE COURT: I hope not. Go ahead.

A I had a lot of confidence in the personnel at Elizabethport.

MR. GRAND: I object. I move to strike his confidence.

THE COURT: Yes.

A Anyway, they told me that they had solved just about all of the problems and had solutions for the remaining problems and that we had a good product and they urged me to go ahead and enter into this second contract.

THE COURT: That was this meeting on Saturday?

THE WITNESS: I don't know whether it was

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Saturday.

THE COURT: Everybody else said it was Saturday.

THE WITNESS: I was not one to work on Saturdays, but I have heard that too.

THE COURT: I am not one to work on Saturdays either. Go ahead.

MR. GRAND: I move to strike this, your Honor. It is the rankest kind of yearsay.

THE COURT: What, that I don't like working on Saturdays?

MR. GRAND: Certainly not. What he was told by the various people at that meeting. We spent hours on that meeting here, you may recall.

THE COURT: No, I will permit it to stand. Go ahead.

A Anyway, I think the thing is --

THE COURT: No, no. We are waiting for the next question.

THE WITNESS: Oh.

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Q Do you recall what you said at this meeting?

MR. GRAND: I object.

THE COURT: No. Do you recall it?

A I recall asking him questions about the project, but I can't tell you specifically what they were. I was interested, for instance, in marketing.

MR. GRAND: I object.

THE COURT: No, no.

Q Did your questions relate to the marketing of the product?

A Yes.

Q Did your questions relate to the technical status of the Perma device at that time?

A Yes.

Q Do you recall what in substance you asked with respect to the technical status?

MR. GRAND: I object to this.

THE COURT: I think we have been through it already, Miss Taylor. If we have it once, why have it twice.

Q I would like to direct your attention to December 21, 1964, which is the date of entry into the contract with Perma.

On December 21, 1964 did you believe that the Perma device was fail-safe?

MR. GRAND: I object.

MISS TAYLOR: Your Honor, I believe that Mr. Hough's state of mind at the time that he signed this contract is relevant to this case.

MR. GRAND: We have been through this time and time again. Mr. Hough's state of mind is totally irrelevant to any issue --

THE COURT: We have been through it a number of times, any number of times.

MISS TAYLOR: Your HOnor, I believe that the understanding of the Singer personnel at the time of entry into this contract as to its fail-safety and other aspects goes not only to the affirmative defense, but quite importantly to the obligations, if any, which we undertook at the time of entry into that contract with respect to perfection of the device.

MR. GRAND: I assume you don't want me to re-argue this point that we have argued already so many

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times, your Honor.

THE COURT: No, I don't think so. I don't think it's necessary. The objection is sustained.

Q On December 21, 1964 did you believe that the design of the Perma device was perfected?

MR. GRAND: Objection.

THE COURT: Sustained.

Q On December 21, 1964 did you believe that the design of the Perma device had been fully tested?

MR. GRAND: Objection.

THE COURT: Sustained.

Q On December 21, 1964 did you anticipate putting the Perma device into production shortly?

MR. GRAND: Objection.

THE COURT: Sustained.

Q At the time of entry in to the December contract did you contemplate that Singer would enter into a program to perfect the device so as to make it fail-safe?

MR. GRAND: I object.

THE COURT: Sustained.

Q On December 21, 1964 would you have approved the entry into a contract with Perma if you had thought that the device was not fail-safe?

MR. GRAND: I object.

THE COURT: It's pure speculation. He did it. Sustained.

Q At any time prior to December 21, 1964 did you ever say that the Perma device was fail-safe?

MR. GRAND: I object.

THE COURT: Did he ever say it?

MISS TAYLOR: Did he say.

THE COURT: I don't understand that, the purpose of the question. I don't understand the relevancy of the answer. Maybe you can make it clear to me.

MISS TAYLOR: Your Honor, I believe his state of mind is relevant. I believe it's a fact to be proven in this case. I believe the fact that he told others that this was a fail-safe device could not be more relevant.

MR. GRAND: I object.

THE COURT: Sustained. Why don't we break at this point. The question is who is going to come back tomorrow. Are we going to have Stanley Irving MacDuff or Lawrence Edwards Hough?

MR. GRAND: I assume they are almost done. My cross will probably be a matter of 10 or 15 minutes. So it seems to me we ought to go forward with both men.

Q Prior to December 21, 1964 had any representative of Perma ever stated to you that the device was fail-safe?

THE COURT: I will permit it. Go ahead, answer it.

A Yes.

Q Who was that?

A Mr. Perrino.

Q When did he make that statement?

A When I was asking him about the history of the project and how it worked and all this business about Detroit being interested and people testing it up in New Hampshire and so forth.

THE COURT: How long is it going to be?

MR. GRAND: I expect less than ten minutes.

THE COURT: It's going to be less than ten minutes.

CROSS-EXAMINATION

BY MR. GRAND:

Q When did you see the Hill report, Plaintiff's Exhibit 57, for the first time, sir?

A I cannot remember when I saw it. I have seen it here in the last couple of weeks and I can remember the name Hill. But I don't remember when I saw it.

Q Did you see it before the December 21 contract?

A I don't know. I don't remember.

Q Did you read it when you saw it?

A No, sir.

Q You didn't read it?

A No.

Q What other documents relating to the Perma case came to your attention that you did not read?

THE COURT: Oh, no. Sustained.

MISS TAYLOR: Objection.

THE COURT: There must be a thousand documents in this case at this point.

Give me that Hill report, will you?

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Q Mr. MacDuff, referring to these exhibits, do they show that the front wheels tend to operate at higher slip levels on lower co-efficient of friction surfaces and at lower slip levels on higher co-efficient of friction surfaces?

A That is the evidence, since the D-657-A curve for .15 mu and is one in which the front wheels clearly operate at or near lock continuously. The .75 mu is one in which, except for the two periods of lockup, resulting from the bouncing of the vehicle, the front wheels seem to operate in what would be considered a very favorable range and is at, did I say, 7.5 mu.

Now, the .5 mu curve, D-678, shows the front wheels operating in a very favorable range, more or less continuously. This could mean that the weight shift characteristics of this particular vehicle on a road having this co-efficient of friction were such that by an accident, the front wheels are suitably controlled. But to have them suitably controlled in one instance out of three clearly indicates that the system cannot meet, for instance, the criterion that it operates effectively as an anti-skid on all types of road.

Q Mr. MacDuff, if the simulation had not incorporated a fixed ratio proportioning valve, would the

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performance of the front wheels that you have just described have been changed?

MR. DE RENSIS: Your Honor, I object to this. This car is a specific automobile which had a proportioning valve in it. If we take that out, but not changing wheel cylinders or anything else, again, we are talking about a specific 1967 Ford automobile, we are asking just for speculation. We are not talking about earlier cars which might have different wheel cylinders.

MR. LAGEMANN: On the other hand,your Honor, this is --

THE COURT: No, no, I will permit it. Go ahead.

A I am perfectly willing to a sume that if you didn't have a fixed ratio proportioning valve in the system, that the system would have been modified as needed so that it would have what would be called normal fixed proportioning, which I described earlier, in which there is one point at which the wheels will lock simultaneously, one point of road friction.

Q Mr. MacDuff, I show you Defendant's Exhibit 683 for identification and ask if you can identify it, please.

A This is a plot of certain data which I derived from the material produced by Mr. DeVilliers with regard to his simulation of a particular vehicle equipped with

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the R times mu determines the torque on the wheel and -- well, I mean, mu times the normal force determines the tractive effort that is being exerted at the surface of the tire, and that multiplied by the radius, the rolling radius of the wheel, determines the torque that is being exerted on the wheel. This torque has to be matched by the brake torque at that particular point.

So this gave me a value of 2090 foot-pounds of brake torque for the assumed condition of a vehicle decelerating on a road having a mu equal to 1.0, the other factors relating to vehicle performance being all derived from the simulation data.

Now, at the same time I determined the normal force at the rear.

THE COURT: Hold on just for a second.

THE WITNESS: Sure.

THE COURT: In this you end up with 2090 foot-pounds, right?

THE WITNESS: Foot-pounds. That is brake torque.

THE COURT: Right. But you have run it across, or at least it appears that the one thing that you did not do there is divide by 2. It is torque at the front divided by 2, and yet as we come across I don't

see the division.

THE WITNESS: Oh. I am sorry.

THE COURT: Before we go into worrying about that, for the purposes of a graphical illustration is the division by 2 necessary, providing you did not divide --

THE WITNESS: The point is -- this may be an error that crept in that was persisted in the typing. I may have corrected my notes. But the point is that if I don't divide by 2 this would be -- the expression here should have been that $2T_F$ is equal to this instead of T_F over 2 is equal to this, because this is based on the total brake torque of the rear axles. The trouble is that the 2 should have been up there, if you consider torque $_F$ as being the torque of one front brake.

I think when I first started to make the calculation I assumed that the torque values that were given were one brake and started to make the calculations on that basis. When I began to actually check the data I discovered that there was a difference. I made the adjustment and I am sure that the chart is correct, but it would take me a little while to recheck it and find out for sure, that this is so.

Q Where you have torque in the front of 663.6 and you have torque in the rear of 398.2.

If you will bear with me for a moment --

A Sure.

Q If you count up approximately 50 400 for the rear and you go approximately 50 600 on the front, 660 on the front, should you --

A You should fall on that curve.

Q You should fall on that curve. Do you fall on that curve?

A Let's look and see. Here is 600 and here is 700, so 660 lies on that line which translates to there (marking); and this value is 398, so going up here, you have 350, 60, 70, 80, 98 and the point falls there. (Indicating.) It's marginally off the curve. I think if you plotted several other points though, you wouldn't get very much deviation from it.

Q Do these curves, the red curves and the green curves represent the ideal distribution without a proportioning valve?

A They represent the ideal distribution regardless of how the brakes are actually distributed in the vehicle.

Q They are a theoretical ideal?

A They are an ideal which is determined by the

1, Plaintiff's Exhibit 1.

Q Mr. MacDuff, in your opinion, was the Perma device as contained in Plaintiff's Exhibit 1 a marketable anti-skid device?

MR. DE RENSIS: I object.

THE COURT: The answer is going to be no. Everybody knows that. I will permit it.

MR. DE RENSIS: There is no foundation for it.

THE COURT: Yes, I know.

MR. LAGEMANN: I believe, your Honor, all his prior testimony is a foundation.

THE COURT: I will let him answer the question.

MR. DE RENSIS: Are we talking about today?

THE COURT: No, we are not talking about today.

Are we talking about today?

THE WITNESS: It certainly isn't marketable today. But if we are talking about 1964 and '64, I feel it was equally unmarketable.

MR. DE RENSIS: I object to '64 and '65.

THE COURT: All right.

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THE COURT: Okay.

THE WITNESS: This may not be up to date. I haven't checked it recently.

THE COURT: Listen, with today's inflation, you have to check from day to day.

Q Do you know what years those prices do relate to?

MR. LAGEMANN: I don't understand the question, your Honor.

THE COURT: Well --

A It some sometime in 1973 that --

THE COURT: He does.

A -- I remember attending an auto show and inquiring, and this is my best memory, because I didn't make any notes as to what I learned by inquiring from sales representatives on the floor.

Q And now, at some point, Bendix marketed an anti-skid device; is that correct?

A That is right.

Q Was that for a period of three years?

A I believe that is correct, yes.

THE COURT: You mean three model years, don't you?

THE WITNESS: Three model years.

Q Was that carried as an option for Chrysler

Imperials?

A Yes, that was available on Imperials only at extra cost.

Q That was the only model it was available on?

A Yes.

Q Can you tell us what the configuration was, that is, the number of modules and the number of modulators on the Chrysler Imperial?

A It had three modules and three modulators.

Q Do you know what the retail price was for the Bendix system?

A I made inquiries concerning that at the same time, and I don't have as clear a memory of that, but it was approaching $300 or in excess of it.

Q Would the amount of $405 refresh your recollection?

A It could very well have cost that much money, yes.

Q But you are clear, are you not, that it was the most expensive anti-skid device?

A There is no question about it, it was the most expensive.

Q Do you know the numbers sold, numbers of Bendix devices sold?

A Very roughly.

in the size of the modulator, and the sales were so low that the retooling cost was so high you couldn't possibly amortize it, and it was decided -- well, the decision was not to retool. I am sure Chrysler would have continued offering the unit if they could have done so without costly engineering changes.

Q That is speculation on your part, isn't it?

MR. LAGEMANN: Objection.

THE COURT: Well, he wasn't there to make the decision, I am sure of that.

THE WITNESS: No.

THE COURT: Is that right?

THE WITNESS: That's right.

Q At some point in time did Bendix sell anti-skid devices to International Harvester?

A Yes, they still do. They did and they still do.

Q Do you know what configuration they use?

A This configuration is a single module with a single modulator controlling rear brakes only, and to the best of my knowledge two-wheel speed sensors are employed and a select low operation is utilized.

THE COURT: Just for my own information, so I won't get lost, what kind of a vehicle was this being used on?

THE WITNESS: International Harvester makes a rather extensive line of pickup trucks and also passenger-carrying vehicles, so-called travelalls, on light truck chassis, and this is the class of vehicles upon which this is available.

Q Do you know what the retail price of the International Harvester Bendix anti-skid devices were?

A No, I have never inquired as to what that was.

Q Do you know how many have been sold to the present time?

A It's my understanding that Bendix has made deliveries to International Harvester of approximately 2,500 units annually, but there is some question as to whether International Harvester actually installed and sold all of these they received in the model year in which they were delivered.

Q Outside of the General Motors, Kelsey-Hayes systems, we have just discussed, and the Bendix system, are there any other systems marketed in the United States today?

A For passenger cars?

Q Yes.

A Not to the best of my knowledge.

Q And in the period between December 21, 1964

and the present time, no one has marketed an anti-skid device in the after-market; is that correct?

A Yes, that is correct.

Q And that is true today?

A It is true today.

Q And now, in preparation for your testimony here today, indeed, this week, you reviewed service manuals of systems that had been marketed, did you not?

A Yes, I did.

Q That includes the General Motors service manual?

A Yes.

Q And that includes the Kelsey-Hayes manual?

A I didn't have the manual from Kelsey-Hayes, but I had a manual prepared by the Ford Motor Company that related to Kelsey-Hayes system.

Q And you reviewed a Chrysler manual?

A Yes, I reviewed a Chrysler manual.

THE COURT: That Chrysler manual would be for last year's model, right? It's not on this year's model.

THE WITNESS: No, the Chrysler manual I reviewed, I believe, was a fairly early one in the series.

THE COURT: Oh, okay.

MR. LAGEMANN: If your Honor will permit, there

A That is right.

Q Mr. MacDuff, isn't it a fact that the Cadillac anti-skid system cycled at three cycles per second?

MR. LAGEMANN: Objection, your Honor.

THE COURT: No. If he knows. When, first of all.

MR. DE RENSIS: Both in 1971 and in 1973.

THE COURT: All right.

A It is very probable that the Cadillac system cycled at approximately three cycles per second.

Q Let me show you the text on page 542 in Plaintiff's Exhibit 153, where it says:

"The entire cycle of partial brake release and reapplication occurs in about one-third of a second."

Does that refresh your recollection?

MR. LAGEMANN: Your Honor, he doesn't need it.

A I didn't need it. I answered the question.

THE COURT: He said it probably did.

A That is equivalent to three cycles per second.

Q Let me show you page 550 of Plaintiff's Exhibit 156 and ask you whether --

MR. LAGEMANN: That's for identification.

THE COURT: Yes.

Q -- and ask you whether the text on that page refreshes your recollection that it cycled at three cycles per second in 1973.

MR. LAGEMANN: Your Honor, I object again. He has given an answer and here is a document that indicates he is correct. What is this need for refreshment?

THE COURT: He said probably. Does it in fact --

A The text of the document is the same. It says that the cycle occurs in about one-third second. They say about one-third of a second and this implies about three cycles per second.

Q Mr. MacDuff, how many modulators and controls does the Kelsey-Hayes system have?

A There is one modulator and one control.

Q Do you know how many cycles per second the Ford device has?

THE COURT: That is the Kelsey-Hayes - Ford device, right?

MR. DE RENSIS: Yes.

MR. LAGEMANN: I object, unless the question is perhaps a little more specific. They have changed from the time of the service manual, which I believe Mr. DeRensis has in his hand.

MR. DE RENSIS: I thought he said he updated his knowledge.

THE COURT: He sure did.

Do you know?

THE WITNESS: The Madison-Riorden paper has a reproduction of an oscillogram, and I would be happy to look at that. It would remind me.

Q Mr. MacDuff, I would like to show you Plaintiff's 154, which is the Kelsey-Hayes manual, and particularly Page 2, second paragraph, under Operation , and ask you whether that refreshes your recollection?

A Yes, this indicates that the cycling rate is

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about four cycles per second.

Q Does that refresh your recollection?

THE COURT: He said yes.

A Yes.

THE COURT: It's about four cycles a second, to the best of your knowledge?

THE WITNESS: Yes.

Q And that is a maximum, isn't it? It is up to four cycles a second.

THE COURT: Well, I will do the interpretation of the words.

Q Is the Kelsey-Hayes device fail-safe, in your opinion?

A It is about as fail-safe as you can make it.

Q I'm not sure that is entirely responsive, Mr. MacDuff. Is the device fail-safe according to your criteria of fail-safe?

MR. LAGEMANN: Objection.

THE COURT: No, I will permit it.

A I would say that, again, it's about as close to being fail-safe according to my criteria as a device can be made.

MR DE RENSIS: Would you read that answer back?

(Answer read.)

Q Would you look at that picture and describe to us what can go wrong with the modulator of the Kelsey-Hayes system that would cause no rear brakes.

MR. LAGEMANN: I object, your Honor.

THE COURT: If he can .

A There is substantially only one defect that I believe would cause loss of rear brakes in the Kelsey, and that would be sticking of the hydraulic plunger so that the check valve remained closed.

Q Are you able to tell us what failures of the control module could cause a loss of brakes?

A There would have to be a failure of the control module which would energize --

Q Do you know?

A Yes, I feel that I know, that a failure in the control module would have to supply an actuating current to the solenoid in order to cause a loss of brakes.

Q Do you know how that would occur?

A No, I do not know precisely how that would occur. The safety switch would ultimately correct that failure.

Q By safety switch, you mean the time delay switch mounted on the actuator?

A Yes.

Q Do you know how long it would take that time

delay switch to correct a malfunction?

A Approximately 40 seconds.

Q 40 seconds?

A 40 seconds.

Q Could you tell us how far you would travel at 60 miles an hour at 40 seconds of time?

THE COURT: No, I will take care of that.

A I could tell you how fast you can stop the vehicle with the front brakes.

Q Do you consider the General Motors System to be fail-safe?

A I think that the answer that I gave with regard to Kelsey is essentially the same, that it is as fail-safe as it can be made, but there are undoubtedly failures which can cause loss of rear brakes.

Q Is it fail-safe by your criteria?

A My criteria included the remote possibility --

Q Please, sir --

MR. LAGEMANN: I think he should be permitted to finish that answer..

MR. DE RENSIS: I think that calls for a yes or no answer.

THE COURT: The question can be answered yes or no first. Is it fail-safe by your criteria?

MR. DE RENSIS: I think he was asked generally.

THE COURT: I believe there was, Mr. Lagemann.

MR. DE RENSIS: Would you read back the question?

(Question read.)

A I would like to have my actual words read back to me.

MR. DE RENSIS: We don't have the transcript of that.

THE COURT: All right, do we have this much: Do you now believe that General Motors and Kelsey-Hayes systems meet that criteria?

THE WITNESS: If that criteria is an absolute, it is practically impossible for any system to meet it.

THE COURT: Does that include Bendix?

THE WITNESS: Yes, because Bendix can have a partial loss under the same conditions that Kelsey could have a partial loss or that General MOtors could have a partial loss; they are equally remote, but the possibility exists.

THE COURT: Okay.

Q Do you know if the General Motors system has a fail-safe electrical contact switch?

A Yes, it does, or it has an electrical contact switch and I believe its function includes fail-safety.

Q Can you describe to us how it operates?

A Well, I believe it is connected into the module and that there is a time delay circuit in the module which is actuated each time that this switch closes as a result of the actuation of the modulator.

If the switch remains closed for the period, for the duration of this time delay, the power system of the anti-skid is shut off and this time delay is, I believe, in the range of 12 or 15 seconds, and in shutting off the electric power, if the failure modulator to return was due to a faulty actuation of the solenoid valve, the system would correct itself at that time and restore the rear brakes.

Q But if the failure was in the module itself --

A The modulator.

Q If it was in the modulator itself, the fail-safe switch would not correct that problem, would it?

A No.

Q Let me direct your attention to Page 560 of the manual, the Cadillac manual, Plaintiff's Exhibit 156, particularly the sentence which reads:

"When the travel switch is open more than approximately four seconds."

Does that refresh your recollection as to the

cime?

A Yes, it is obvious I didn't remember the exact time.

Q So it is four seconds?

A Four seconds is what they say. There is another system that says if the signal light is turned on --

Q There is no question.

A Oh, I'm sorry.

MR. LAGEMANN: Your Honor, I must object to this, upon reading this paragraph, which wasn't specifically identified in the question addressed to the witness. The four-second delay period applied to turning on of the warning light. I ask that either the question be reframed or the answer be stricken.

MR. DE RENSIS: I asked him if it refreshed his recollection, your Honor. He said that it did.

THE COURT: Yes, I will permit it to stand.

Q I would like to show you Plaintiff's Exhibit 107. That is the Hydrasearch proposal. Do you recall testifying in response to questions by Mr. Lagemann --

MR. BENBOW: Page?

MR. DE RENSIS: 6600, 6601.

Q "Q. Mr. MacDuff, referring again to the Hydrasearch proposal in Defendant's Exhibit 15-B, would

possible in a friction drive like this for these materials to deposit on anything that is in there. So that let's say this thing was operating in a not-too-desirable environment.

Q Is it also possible to get seizure of the tone wheel?

MR. LAGEMANN: Objection.

THE WITNESS: I have no information concerning this.

Q Do you know whether Bendix encountered a problem with missing teeth, with broken teeth, on the tone wheel?

MR. LAGEMANN: Objection.

THE COURT: I will permit it.

A No, I have no knowledge of this.

Q Do you know if Bendix encountered a problem with the rubber drive band wearing badly.

MR. LAGEMANN: Your Honor, I object again.

THE COURT: No, I will permit it.

A No, I have no knowledge of this.

Q Is the tone wheel subject to seizure?

MR. LAGEMANN: Objection.

THE COURT: No, I will permit it.

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A Anything that rotates on bearings has a possibility of seizure.

Q And so this tone wheel does --

A It rotates on bearings. It is subject to seizure.

Q It is subject to seizure. Is it also subject to missing teeth?

A I wouldn't know the answer to that question.

Q Do you know whether Bendix established a procedure for inspecting the tone wheel to determine the wear?

A No, I do not know.

Q Do you know if Bendix established a procedure for the removal of deposits on the tone wheel?

MR. LAGEMANN: Objection.

THE COURT: No, I will permit it.

A No, I don't know that.

Q Do you know if Bendix established a procedure to inspect the tone wheels for damaged or chipped teeth?

MR. LAGEMANN: Objection again, your Honor.

THE COURT: No, I will permit it.

A No, I do not know that.

Q Let me show you the Chrysler manual, which is Plaintiff's Exhibit 155, in particular step B, which

you mean?

Q Yes, sir.

A Yes, they have check valves.

Q Did Bendix encounter a problem with the check valves of the modulators it marketed in connection with its anti-skid system?

MR. LAGEMANN: Objection.

THE COURT: No, I will permit it.

A I am not aware of such a problem.

Q Do you know if Bendix encountered a problem with leaking check valves?

MR. LAGEMANN: I object again, your Honor.

THE COURT: No, I will permit it.

A I am not aware of such a problem.

Q Is the Bendix check valve subject to a problem of leaking?

MR. LAGEMANN: I object.

THE COURT: Is it subject to?

MR. DE RENSIS: Subject to leak.

THE COURT: You mean can it leak?

MR. DE RENSIS: Can it leak.

THE COURT: Why didn't you say so.

Can it leak?

A Yes.

"An additional step is necessary to disable the system for one type of failure that can possibly occur. This is a failure that causes the pressure modulator diaphragm plate to stick in the retracted or partially retracted position."

Is that what you were referring to?

A That possibility of failure was in my mind.

Q Does Chrysler have a procedure set out in its manual to deal with that problem?

MR. LAGEMANN: Objection, your Honor. The manual is in evidence, and if it does, it would be in the manual. The witness doesn't have to be asked.

THE COURT: That is true. But let me see right now. Where is this ?

MR. DE RENSIS: Starts here,"Disabling the Sure-Brake System."

THE COURT: Okay, it does.

Q Is there some kind of fail-safe switch in the Bendix system?

A Something called a fail-safe switch?

Q All right, something called a fail-safe switch.

A Is that what you ask? I'm trying to clarify --

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THE COURT: That is what he is asking, is there something called a fail-safe switch.

A Something called a fail-safe switch? The only thing that I know of -- well, actually, I don't know of anything that is specifically called the fail-safe switch.

Q All right, let me show you Defendant's 655, page 6, an item titled "Fail-Safe Switch," and ask you whether that refreshes your recollection.

A I had heard of that referred to, and I referred to it myself as the stroke switch in the modulator, and it does have the fail-safe function.

Q Can you tell us whether that is a contact switch?

A Do you want me to explain how it works?

Q No, I want you to answer my question.

A The term, a contact switch doesn't mean anything in my technical terminology.

Q Does sense contact by the physical contact of the switch and the diaphragm?

MR. LAGEMANN: I object, your Honor. The question I think is improperly framed and unclear.

THE COURT: No, I think it is clear, quite clear.

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A The switch is actuated by engagement of a plunger with the diaphragm plate, the plunger being a part of the switch.

Q Can you tell me how many cycles per second the Bendix system has when it operates?

A It's in the range of three cycles per second.

Q Does this switch contain a time-delay element?

A The switch does not contain a time-delay element.

Q Does the logic behind the switch contain a time-delay element?

MR. LAGEMANN: Objection, your Honor.

THE COURT: No, I will permit it.

A To my knowledge, the control module has a time delay circuit which operates in relation to the operation of the switch.

Q Can you tell me how long that time delay is?

A I can't tell you the exact period of time.

Q Is in the range of four seconds?

A I'm not absolutely sure.

Q Can you give us an estimate?

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MR. LAGEMANN: Objection, your Honor.

THE COURT: No, I will permit it.

A It could very well be in that range. I can't remember just at the moment.

Q Could it be as large as 40 seconds?

A I say I can't remember.

Q Did you know how long that time delay was when you rejected the Hydrasearch proposal for the one-second period?

MR.LAGEMANN: Objection, your Honor.

THE COURT: No, I will permit it.

A It's possible that I did. I have a memory of having read the figure, but I also have occasional lapses with regard to figures, that they don't come back to me easily.

Q Do you remember where you read it?

A I'm reasonably sure that it was referred to in the Schafer-Madison papers, the development of the Sure-Track.

MR. GRAND: Schafer-Douglas?

A Yes, Schafer-Douglas. I'm sorry. Schafer-Douglas.

THE COURT: What exhibit is the Schafer-Dougl

MR. DE RENSIS: Defendant's 655.

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the hydraulic piston would retract, if there were pressure in the system, and the check valve would close. This would reduce the driver's ability or eliminate the driver's ability to change the pressure in the brakes affected by that modulator.

Q Do you know whether the Bendix Corporation encountered a problem with leaking air valves in connection with the anti-skid devices it marketed?

MR. LAGEMANN: I object.

THE COURT: I will permit it.

A No, I am not aware of such a problem.

Q Is it possible that dirt, moisture and other contaminants pass through the filter and settle on the air valve?

A Yes, that is a possibility.

Q Do you know if the Chrysler Corporation has a procedure for detecting air valve leaks and repairing air valve leaks?

MR. LAGEMANN: I object, your Honor.

THE COURT: Do you know whether they have such a procedure?

THE WITNESS: I don't know for sure, but I suspect that they have made a procedure for every possible failure that could be anticipated.

5 jksr MacDuff - cross

Q You don't know if they have any air valve tests?

MR. LAGEMANN: I object.

THE COURT: He already said that. Listen.

Q I show you Plaintiff's Exhibit 156, Page 5-73, particularly test No. 8, where it says, "A leaking air valve can prevent full pressure from getting the wheel brake affected," and ask you whether that refreshes your recollection that Chrysler Corporation did have procedures--

A It doesn't particularly refresh my recollection because I don't remember reading that particular portion of this manual.

Q Does that refresh your recollection that it is not nearly impossible for an air valve leak to occur?

MR. LAGEMANN: Object, your Honor.

THE COURT: No, I will permit it.

A Well, I didn't say that it was nearly impossible for a leak to occur. I said it was nearly impossible for the valve to remain stuck in a retracted position. Leakage can occur by some contamination on the seat, a particle which is large enough so it wouldn't be imbedded in the rubber seat surface.

Such leakage would be small, but if it were large enough, it would result in motion of the diaphragm plate and closing of the check valve.

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Q And a loss of brakes in one or more wheels?

A Yes.

Q Does the Bendix modulator connect into the hydraulic brake lines of the vehicle?

A Yes, it does.

Q Can you tell me what would be the effect of the leak of hydraulic fluid in the Bendix modulator?

A It would be the same as the result of any leak in the hydraulic system; it would result in loss of fluid over a period of time.

Q What would that result in?

A Ultimately it can result in loss of brakes.

Q Loss of brakes in just the wheel affected by that module?

A In that portion of the brake system which is in communication with the leaking tube or element.

Q So it could be the entire master cylinder circuit?

A It could be one half of a split brake system in any modern automobile.

Q Can you tell me what fail-safe device or switch Bendix has to overcome that?

MR. LAGEMANN: I object, your HOnor. We are not talking about failures now in the anti-skid. We are

talking about brake systems.

THE COURT: No, we are not. No, this is right in the anti-skid. Go ahead, answer the question.

A In the controversy, I missed the question.

THE COURT: Read it, please.

(Question read.)

A The brake warning light switch will be actuated when such a failure reaches the point where the pressures in the two halves of the split system are sufficiently different to actuate the light, and this will tell the driver that he has a partial brake failure.

THE COURT: Is that caused by the anti-skid system or is that part of the Chrysler line?

THE WITNESS: Well, in each module there are two hydraulic connections, but in the entire one half of the brake system leading from the master cylinder to the wheels there may be 15 connections.

MR. DE RENSIS: I don't think this is responsive.

A It doesn't matter which one of them leaks. The protection is against leakage of any of them.

THE COURT: In other words, it is put in by Chrysler, not by the anti-skid device, right?

THE WITNESS: That's right.

Q This brake warning light has no function to

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restore brakes to their normal capabilities, does it?

A It has the function of telling the driver that he should restore them.

Q That is not responsive to my question.

A It does not restore them

Q Thank you. Do you recall testifying about the effect of a dent, that is, a severe dent on the Perma-Vac can?

A Yes, I do.

Q Let me ask you this: Can you tell me the effect of a dent in the Bendix modulator severe enough to cause a puncture of the front of the can?

MR. LAGEMANN: I object again.

THE COURT: No, I will permit it.

A Such a dent would perform the same function as a leaking air valve.

Q Would that result in loss of brakes?

A Yes, it would.

Q Do you recall testifying about --

A I would like to correct my answer.

Q Which answer?

A The last answer that I made.

THE COURT: Go ahead.

A There is no portion of the shell or can of the

Bendix modulator which is in communication with the front portion, the front chamber of the modulator, so that actually any puncture, unless it actually also punctured the elastic diaphragm, would only communicate air to the rear chamber, which would tend to render the operation of the modulator, tend to render the modulator incapable of operation.

Q Where is the plastic diaphragm to which you are referring?

A The plastic diaphragm -- the margin --

MR. LAGEMANN: Are you referring to an exhibit? Maybe we should have it identified?

THE WITNESS: Yes, I am referring to D-655, Figure 8, and the plastic -- I mean the elastic diaphragm, its outer margin actually forms a portion of the seal between the two chambers and also between the can and the cast front plate of the housing, and as you look at this, you can see that a puncture of the can anywhere where it is exposed so that it can be punctured is actually on the rear chamber side of the diaphragm, so that leakage through the hole would enter the rear chamber. It would be necessary to puncture this rather heavy iron casting in order to permit such leakage to the front chamber.

Q I thought my question was directed to the front portion of the can.

A Well --

Q If the front portion of the can were dented.

A Do you think someone is going to take an ice pick and pierce this and the diaphragm at the same time?

Q I am not suggesting the side of the can, Mr. MacDuff. I am suggesting the front of the can.

A The front of the can is a heavy iron casting. It's anywhere from a quarter to a half an inch thick. I don't see that being punctured very readily.

Q I thought the question was what was the effect of a dent severely enough to puncture the front of the can.

A If somebody takes a sledge hammer to this thing, I am sure you are going to have trouble. That's what it would take.

Q Would it cause a loss of brakes?

A I am sure it would.

Q All right. Now, when you are talking about a seal, you are referring to a black line on this drawing?

A Yes, that is the rolling diaphragm.

Q That is the rolling diaphragm itself, is it not?

A That's right.

Q That is not a seal?

MR. LAGEMANN: I object, your Honor. Obviously --

THE COURT: No.

A The rolling diaphragm constitutes the seal between the front and rear chambers. To that extent it is a seal. It also itself constitutes a seal on the inner margin, against the diaphragm plate of the modulator, so that air cannot leak around, from one side past the surface of the diaphragm into the other chamber. It constitutes a seal between the shell and the casting at its outer margin where it is secured.

If it didn't constitute a sealed air, leakage would be permitted and it would not function.

Q But it is your testimony that making the front of the can out of cast iron resolves the problem of dents severe enough to cause a puncture; is that correct?

A The only elements in a --

Q Could you answer that yes or no?

MR. LAGEMANN: Your Honor, I object to that. The witness was about to answer it.

THE COURT: Yes, first ask for a yes or no and then we will go on from there.

A What do you contemplate is going to puncture it and then I will tell you the result.

THE COURT: Can you answer the question yes or no? In other words, you talk about the Perma-Vac can being dented, right?

THE WITNESS: The Perma-Vac can can be dented, and this can can be dented, but it doesn't produce the result that he anticipated it would.

THE COURT: If the Perma can was made out of cast iron you'd say the same thing about it, right?

THE WITNESS: Yes, but I am not saying this can is made out of cast iron, but I am saying the front portion of it is made out of it, and if the back of the Perma-Vac can were a heavy iron casting, I would say that it would be substantially impossible that any occurrence that I can imagine under the hood of a vehicle, short of a wreck or something, which would not -- would not dent it.

THE COURT: All right.

Q Now, sir, do you remember testifying about a partial failure of the Perma system resulting from the breaking of the Perma-Vac spring?

THE COURT: Do you have a page on that?

MR. DE RENSIS: It is in the area of 6557.

A My testimony was that --

Q Could you answer yes or no?

A That the breaking -- I remember the testimony, but it is not as you stated it, so I remember testifying concerning the breaking of the spring, but not as you stated it, so the answer is no.

Q Do you remember testifying about the subject?

A The answer is I don't remember testifying to that.

THE COURT: You do remember testifying about the subject?

THE WITNESS: I testified with regard to the subject, yes.

THE COURT: Okay, go ahead.

Q Can you tell me what effect a breakage of the Bendix spring would have on the pressure output of the Bendix modulator?

A It would have the same effect as on the Perma; it would reduce the pressure which can be supported in the brake system, when there is no actuation of the modulator.

Q Is there any fail-safe or fail-safe switch that overcomes that failure?

MR. LAGEMANN: Objection, your Honor.

THE COURT: No, I will permit it.

A No, such a failure would --

Q I think you have answered the question.

A I thin' no, that is all, there is no fail-safe.

Q We can agree, Mr. MacDuff, can we, that there are failure modes or combination failure modes in the Bendix system which can lead to a loss of brakes in one or more wheels?

MR. LAGEMANN: I object, your Honor, especially the agreement portion of the question.

THE COURT: Strike the agreement portion. Is it true today?

Go ahead, answer the question.

A Well, I have just testified to such possibilities.

THE COURT: Okay.

Q And yet is the Bendix anti-skid system fail-safe by automotive standards?

A I would say that since it has been accepted and sold it has to be considered fail-safe by their standards.

Q Sir, I want to read to you a definition of fail-safety and ask you whether any anti-skid device marketed in the United States satisfies that standard, and the standard is as follows:

"We do not regard a device as fail-safe unless failure of the device, regardless of cause or probable

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frequency of a particular type of failure, does not impair the utility of the underlying system to which it is connected."

A And the question is?

Q Does any anti-skid system marketed in the United States satisfy that definition?

MR. LAGEMANN: I object.

THE COURT: No, absolutely not. It is a perfectly proper question.

A No, it does not.

Q That is, has any system ever marketed in the United States, in the past, satisfied that definition?

MR. LAGEMANN: Objection.

THE COURT: No.

A Has any system? What kind of system?

Q Anti-skid system.

A No.

Q Mr. MacDuff, in your opinion, could an anti-skid system be made to satisfy that definition?

MR. LAGEMANN: Objection.

THE COURT: No, I will permit it.

A It would be extremely difficult.

Q Almost impossible?

A Almost impossible.

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Q Do you know if they are predictable?

A No, I do not know that.

Q Have you ever seen a Kelsey-Hayes module?

A Yes, I have seen Kelsey-Hayes modules.

Q Do you know what is written on the Kelsey-Hayes module?

MR. LAGEMANN: Objection.

THE COURT: I don't understand that.

Sustained.

Q Is there some writing on the Kelsey-Hayes module?

THE COURT: On the outside?

MR. DE RENSIS: Yes.

A I wouldn't have any notion whether there is because it has been a long time.

Q Do you know if Kelsey-Hayes puts on its module the word "fragile," and I show you the Ford manual, Exhibit No. 154, Page 29, Figure 28.

A Well, I can assume it says fragile, do not drop, and that the shock levels, if you dropped this device, would be 10 or 15 or 20 times what they may be subject to when it is properly installed in the vehicle.

MR. DE RENSIS: Would you read back my question?

(Question read.)

A Yes, it says, "Fragile, do not drop."

examination of the hardware and the drawings?

MR. LAGEMANN: Objection.

THE COURT: You mean immediately apparent?

MR. DE RENSIS: Yes, sir.

THE COURT: I will permit immediately.

MR. LAGEMANN: I still object.

THE COURT: I will still permit it.

Go ahead, answer.

A That is an almost impossible question to answer.

THE COURT: If you can't answer it, you can't.

A I don't remember when I reached these conclusions. I spent a lot of time studying this thing.

THE COURT: Okay.

A I was immediately aware of the fact that the governor was an unsuitable device because I had studied it previously and my conclusions previously were based upon the use of the govenor.

THE COURT: All right. Go ahead.

Q Was the lack of fail-safety one of those defects that were apparent to you upon a review of the hardware?

THE COURT: This is after the review.

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A It became apparent fairly readily, but not, I would say, immediately. It takes some time to analyze possible failures and the effects of possible failures.

Q Are you able to determine the lack of fail-safety from an examination of the hardware and the drawings?

MR. LAGEMANN: I object.

THE COURT: No, I will permit it. You mean examination of the hardware, the drawings and analysis.

MR. DE RENSIS: And thought process, yes.

A I am able to predict the possibilities of failures of mechanical devices of ordinary configurations and types because any engineer understands how these things work and by analysis you attempt to follow a sequence of operations, you analyze what happens if a certain failure occurs, whether this results in something else happening, and I made a rather exhaustive analysis of such possibilities of the Perma system in the past year or two.

Q Sir, how long, from your examination and analysis, did it take you to determine that there was no fail-safe for a stuck rotary valve?

MR. LAGEMANN: Your Honor, I object to the

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Q What does it mean the term OEM equipment is used?

THE COURT: It means when the car is first purchased by a consumer and it has got the equipment on it, is that correct?

THE WITNESS: Yes, it means that the equipment is installed by the factory at the time of manufacture and that when the customer buys that car, it has been placed upon it by the factory. It is original equipment at the factory.

Q What would happen if I had a radio, a Chrysler radio on my shelf and I were a Chrysler dealer and a customer came in and wanted a car with a radio and I put it on myself; would it still be original equipment?

A Technically it would not be. However, it would be difficult to distinguish after the car left the dealer's showroom.

THE COURT: Okay.

Q What would happen if I were a Ford dealer and I put in a Chrysler radio; would that be original equipment?

THE COURT: I think we are trying to differentiate; it would not be original equipment, right?

THE WITNESS: That's correct.

THE COURT: Anything that is not put on at the factory is not original equipment?

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Q Can you explain whether it comes from Ward's Automotive Reports or Ward's Automotive Weekly?

A In those cases where Ward's Automotive Annual Report has been published it utilized that information, because they have had a chance by the time that comes out to go through the statistics and make sure they are correct.

I would like to note that in Exhibit A for the 1973 model year installations of anti-skid devices, which is the third page from the back in the exhibit, in Exhibit A, that the Ward's Weekly Reports, from which this

was taken, indicates that 170,412 anti-skid devices were sold during the 1973 model year. Analysis of the numbers up above that shows that that is incorrect. If you will apply the percentages shown in each column against the number of vehicles sold for each of those models you come up with 80,002, I believe is the number.

MR. GRAND: Where does this 80,002 appear?

THE WITNESS: This 80,002 appears on the first page of Exhibit A in the -- I am sorry. It should be 81,002, 81,002 for the total anti-skid sales on Ford Motor Company vehicles during the 1973 model year.

MR. GRAND: Is that derived from something that is in here?

THE WITNESS: That is derived from an analysis of the numbers. What I have taken there is taken, for example -- taken and applied, if you will refer to the third-to-the-last page in the exhibit, the 5.9 per cent for Thunderbirds, and there were 82,711 Thunderbirds sold during that year with -- sold in total. 5.9 per cent of ghose had anti-skid devices. That makes a total of 4880 that were dold as optional equipment on Thunderbirds.

On the Lincoln 7.0 per cent of the total production was sold with anti-skid devices, total production

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was 58,635, total anti-skid sales were 4104, by applying that percentage against the total production.

Taking the Mercury, 1.4 per cent of the Mercurys were sold with anti-skid devices, production was 184,359, a total of 2581 anti-skids were therefore sold.

When you total that up with the 100 per cent from the Mark IV you reach 81,002 units, total sales for Ford in 1973.

That is why I used the Ward's Automotive Annual Report versus these weekly reports, because they haven't had time to proofread these before they put them out or they don't do as much proofreading.

Q Do you know what the total figures are for anti-skid devices as standard equipment on American cars --

MR. GRAND: I object to this.

Q -- through March 31st, 1974?

MR. GRAND: I object to this.

THE COURT: You mean the total?

MS. RAWSON: Yes.

MR. GRAND: This is not the way to prove facts. This man didn't do any survey or study of these. He read Ward's report to get this information.

THE COURT: All right, so he did.

MR. GRAND: Pardon?

THE COURT: He can add.

MR. GRAND: I question that. I mean, with all due respect to the witness, I question the Ward's report, the automotive news reports, what he did with the files. I object to it. I don't think it is the way to prove facts.

THE COURT: Go ahead, tell us what your total is.

THE WITNESS: I believe that a total of 211,772 units, anti-skid units, have been supplied on American passenger cars as standard equipment up through and including March 31st, 1974.

Q Do you know how many have been supplied as optional equipment?

A Yes, a total of 63,389 units have been supplied through March 31st as optional equipment.

Q Do you know what percentage of these devices

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were sold as standard equipment?

MR. GRAND: I object to this, your HOnor.

THE COURT: I assume we are still doing arithmetic. I will permit it. Go ahead.

Go ahead.

A Of the total number of units, 275,161 that had been sold on American passenger cars through March 31st, a total of 77% of those units had been supplied as standard equipment and 23% had been supplied as optional equipment.

finally marketed their device to the Chrysler Corporation for their 1971 model, had developed this device at least to a sufficient degree so as to try to market the device or, rather, to advertise the fact that they had developed the device at least by the Spring of 1970. I am led to believe that because in this book here, the 1970 Ward's --

THE COURT: I don't care how you are led to believe it. Why does that foreclose the Perma device from the Chrysler Corporation? This is 1966.

THE WITNESS: The Perma device, if they had approached the Chrysler Corporation, would --

THE COURT: We assume it's perfected now.

THE WITNESS: I understand. It's a perfected device.

THE COURT: Yes.

THE WITNESS: At that point in time I assume it would have to be untested by the Chrysler Corporation, they had perfected it to the standpoint that they had satisfied themselves internally. That is the assumption I am making.

THE COURT: All right. Go ahead.

THE WITNESS: They would have to then offer that to the Chrysler Corporation for a test. I am

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assuming that they could do so.

THE COURT: Yes.

THE WITNESS: And they would proceed from that point in time to deal with Chrysler.

THE COURT: So then they were not foreclosed from Chrysler.

THE WITNESS: They were not foreclosed from dealing with Chrysler.

THE COURT: And therefore when you said that they would be unable to meet the competition in the OEM you didn't mean that; is that right?

MS. RAWSON: Your Honor, I believe his testimony was they were not foreclosed from dealing with Chrysler. Perhaps if he continues --

MR. GRAND: I think there is a question that is not answered.

THE COURT: There is a question pending. Let him answer it, Ms. Rawson.

THE WITNESS: No, sir, I still don't believe they would have been successful with the Chrysler Corporation in selling their device to them.

THE COURT: Okay. Go ahead.

Q What about General Motors?

MR. GRAND: Are we going to get a basis for

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THE COURT: You are talking about a development cycle. Is it a development cycle that caused this three-year lag?

THE WITNESS: Perhaps I can explain what I mean by the development cycle. The automotive companies three years prior to the actual introduction of any one particular model sit down and begin to make determinations from -- begin to determine what that car will look like, what that car will do and what options or devices or components that car will have. That cycle proceeds through approximately the first year of that three-year period and by the end of the first year, in general, the general design of the car is fixed, the general components that will be offered on the car are fixed, they have

decided to offer anti-skid or not to offer anti-skid tentatively, and they proceed from that point in time to insure that the engineering components that go on that vehicle will all fit together and all work.

That engineering development of the component or interface development cycle ends approximately one year prior to the new model launch, when they start going out and procuring the specific tools and procuring the specific components or making procurement arrangements for the specific components that will be used on that vehicle.

Now, with respect to the Ford Mustang, I can testify that they were in the first development stage or that initial design development stage of that during the period 1961-'62 in order to bring out that vehicle. I know because I was working at Ford Motor Company at the time that when Ford was considering or in the process of developing the Mark IV that they were in process of letting component contracts for that car, in other words, making purchase arrangements for the components of that car approximately one year prior to that during the time I was at the Autolite Fords Parts Division.

Q Mr. Bechthold, yesterday you were testifying about a three-year product development cycle for the automobile companies. Continuing to assume that the Perma device was technically perfected by the Spring of 1966, do you have an opinion at what point in time the Perma device would have entered the development cycle of

the OEM companies?

A Yes.

MR. GRAND: I object to this.

THE COURT: I am not sure I understand the question. Let me hear it.

(Question read.)

MR. GRAND: I object to it, your Honor. Whatever he testified about yesterday, although he called it a product development cycle, seemed to me to be quite different from that. We certainly do not know from this witness' testimony what this three-year cycle is in terms of every single model offered, that is, whether it is the same three-year cycle for every model. We don't know to what extent it depends on the fact that we all know that every three-year period there's a substantial retooling and model change. I mean, we were floating around in a great deal of confusion, and I think that this question only adds to the confusion. I object to it.

MS. RAWSON: The question, your Honor, was whether he had an opinion, not what the opinion was.

THE COURT: Yes, I will permit it. Go ahead.

A Yes, I do.

Q And what is the basis for that opinion?

A The basis for that opinion is my knowledge of

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the product development cycle gained both while I worked at Ford from 1967 through 1970, and through my work with Ford since I have been with the A. T. Kearney Company, as well as information or knowledge that I gained while studying at the University of Michigan.

MR. GRAND: I object to this. It is all conclusive. It doesn't give us any facts from which we can judge the basis. He has replaced the Judge with his own conclusions. I object to what he is saying now.

THE COURT: No, go ahead, continue.

A During these two courses, one was marketing and procurement, the other product development, or new product development.

During the marketing and procurement course, we received a guest lecture from the vice president or then-vice president of purchasing for Ford Motor Company on the purchasing cycle within the product development cycle as to what point in time and the criteria which were used in purchasing automobile parts for use on new cars, and during the new product development course we received two lectures during that course from the manager of product development at the Ford Motor Company, specifically explaining the automotive three-year product development cycle.

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Q Can you explain to us what this development cycle consists of? Can you give us a definition or an explanation of this development cycle?

THE COURT: We went through that yesterday.

MS. RAWSON: I believe there was some misunderstanding, your Honor, which we would like to clear up this morning.

THE COURT: Sure, go ahead.

A Yes. I can break this product development cycle down into three one-year periods, each leading into the other.

In the first of the three-year periods --

MR. GRAND: This we had yesterday.

THE COURT: I know; we are going through it again.

MR. GRAND: In just this form.

THE COURT: Go ahead. Go ahead.

A The first of the three-year periods is a period in which the product package is determined, that is, the automobile to be introduced three years hence is determined from a basic design standpoint, and from a basic functional standpoint as to which functions would be offered on that automobile.

The second of the three-year periods is confined

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to or is used for the development of the specific engineering necessary to insure that the components that are specified or that are decided on in the product package fit together and work together correctly.

The third year in this cycle is utilized to allow companies to develop the specific tooling at the beginning of the third year, purchase contracts or purchase agreements would be let to the companies who have been selected to supply the components. They then purchase the production tooling, utilize this tooling in producing initial parts for testing, to make sure that the entire car fits together before it goes in.

During the first year of this cycle, when the product package is being determined, the companies may be in the process of testing new components, new products, new devices for use on automobiles three years hence, and it is at this point in time that they decide or they make a decision whether or not to include a specific component on a product package. It may be that they have been approached with a component that is perfected in terms of the fact that it works at the point of time which it is delivered to them, and then they make the decision to add that to the package or, in turn, they may be approached by a number of companies who are interested

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manufacturing a specific component, and they feel due to their knowledge and understanding of the capabilities of these companies that they will be able to exert sufficient development effort to have that component ready three years hence, and they may include it in the product package.

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Q What is your opinion as to the point in time the Perma device if offered in the spring of 1966 as a perfected device would have entered the development cycle of automotive companies.

MR. GRAND: I object to this, your Honor. First of all, at least in substantial measure this man's opinion is based on what somebody lectured to him about back in the university. So it's not his opinion, it's a rehash, to the extent that he can do so, years later of somebody else's opinion.

In addition, we have no basis or groundwork established that the cycle is the same for every manufacturer of every automobile.

THE COURT: And we have no basis whatsoever that the cycle is the same for every type of component part.

MR. GRAND: That also.

THE COURT: All right. Go ahead, answer it.

THE WITNESS: Could you read the question?

(Question read)

Q Assume the Perma device was offered to the OEM companies and they considered it and accepted it, it was technically perfected as of the spring of 1966. At what point in the three-year development cycle would the

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device have entered?

A It would have entered at the --

MR. GRAND: I am sorry. Would have entered what?

THE COURT: I don't know. Let's find out.

A It would have entered the product -- the three-year product development cycle at the very beginning. That is, it would have had to have been accepted by the automobile company, by any one of the automobile companies. for use in one of their product packages, ie., one of their models. Since they determine these three years prior to model year launch, it would have gone in as a -- in the initial portion of that product development cycle.

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THE COURT: Do you know the cost the Ford Motor Company paid to the Kelsey-Hayes Corporation for the anti-skid devices per unit?

THE WITNESS: In 1974? Yes, sir.

THE COURT: All right. How much was it?

THE WITNESS: Approximately $68.

Q Do you know, sir, with respect to the Buick Roadmaster, if it is still made?

THE COURT: You're showing your age.

MR. GRAND: The only Buick I can think of.

A I can't remember whether the Buick Roadmaster was in the 1967 to '70 model year. I remember the name, but don't remember when it was.

Q Can you tell me whether there was more than one change per model year between 1967 and '70 for the Buick Electra?

A No, I specifically cannot.

Q And I gather the answer would be the same with respect to the Chevelle?

A Yes.

Q And with respect to the Oldsmobile Delta 88?

A Yes.

Q And with respect to every other car manufactured in the United States?

A On a specific basis, yes.

Q And now, you gave as an example of the three-year development cycle, in response to questions by the Court, the experience with disc brakes at Ford. Do you recall that?

A Yes.

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MR. BENBOW: Could we have a page?

MR. GRAND: It is at 7735.

Q And do you recall that the product development cycle that you gave was for the period 1965 to 1968?

A Yes.

Q So that if I am correct, the development --

MR. GRAND: Withdrawn.

Q -- the beginning of that three-year cycle was in 1965, is that correct?

MR. BENBOW: Could I hear the whole question now?

MR. GRAND: I will withdraw it and start over.

Q Am I correct that the beginning of the three year cycle with respect to the disc brakes was 1965?

A No. I'm sorry, with respect to the disc brakes offered -- I'm sorry, with respect to the disc brakes offered on the 1968 model Fords?

Q No, with respect to the disc brake system you were talking about, which was front power disc brakes.

A As standard equipment on all -- I was talking about power front disc brakes that were standard equipment on all Ford cars where power front brakes were specified as an option.

Q You also testified, didn't you, that in 1965,

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at the beginning of this cycle, those brakes were offered as an option on some cars?

A Yes, I believe on the Thunderbird.

Q Does that mean, sir, according to your experience, that the beginning of a product development cycle can be coincidental or simultaneous with the offering of the option or accessory on a model?

MS. RAWSON: Objection, your Honor. He has testified as to the cycle of the '68 models, not as to the cycle of those disc brakes offered in '65.

THE COURT: Were disc brakes perfected before 1965?

THE WITNESS: As far as I know, they were a perfected device prior to 1965, yes.

Q Do you know, sir, when Ford made the decision to introduce disc brakes on the Thunderbird in 1965?

A Not specifically, I do not.

Q Do you know if it was three years before 1965, two years before 1965, one year before 1965 or some other period?

MS. RAWSON: Objection, your Honor.

THE COURT: I will permit it. Go ahead. Do you know?

A I can only, based on my knowledge and background,

speculate. I do not have specific knowledge.

Q No, I don't want you to speculate. I want to find out what you know.

THE COURT: He said he does not have specific knowledge.

MR. GRAND: All right.

Q Do you know, sir, on what date the Ford Motor Company made the decision to market the Kelsey-Hayes anti-skid device on its 1969 model cars?

A Not the exact specific date, no. I know when they would have had to have made their final decision.

Q No, no, that's according to your theory you'd know, you could surmise when, isn't that correct?

A That is correct.

MS. RAWSON: May I have that question before the last one read back?

[Record read.]

Q Do you know, sir, when the Kelsey-Hayes anti-skid device was perfected?

A Not specifically, no.

Q Do you know, sir, whether it was perfected prior to the Spring of 1966?

A No, sir, I do not.

Q Do you know, sir, when the Bendix system was

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perfected?

Before I get to that, let me withdraw that.

Do you know, sir, whether the Kelsey-Hayes Corporations sells its disc brakes to any corporation other than Ford Motor Company, any other original equipment manufacturer than Ford Motor Company?

A Yes.

Q Do they sell to the Chrysler Corporation, sir?

A Yes, they do.

MS. RAWSON: Objection; relevance.

THE COURT: I know where it is going.

Q Did they sell to the Chrysler Corporation in the mid-1960's, sir?

A I do not specifically know whether they did or not.

Q Do you know, sir, whether they worked closely with the Chrysler Corporation in the mid-1960's?

A Yes, I do.

Q Did they work closely with the Chrysler Corporation?

A Yes, they did.

Q They did?

A That's correct.

Q And that did not in any way prevent the Bendix

Corporation from marketing its anti-skid device to the Chrysler Corporation, did it, sir?

MS. RAWSON: Objection.

THE COURT: No, I don't think it is necessary.

MR. GRAND: All right.

Q Can you tell me, sir, when the Bendix Corporation anti-skid device was perfected?

A No.

Q Can you tell me, sir, when the General Motors anti-skid device was perfected?

A Not specifically, no.

Q Can you tell me, sir, from your own knowledge whether either the General Motors device or the Bendix device was perfected three years before it was offered to the public?

A No, I cannot, but that would not affect its entry into the product development cycle as I indicated earlier.

Q The answer is you can't tell me, is that correct?

MS. RAWSON: Objection.

THE COURT: That is what he said.

Q Can you tell me, sir, if you are aware that in the 1963 model year the Ford Motor Company introduced both a new 406 cubic inch high performance engine and

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transistorized ignition as optional equipment? Do you know whether that is a fact?

A Do I know specifically whether that is a fact? No.

Q Did you ever know about that subject? If so, I will show you this and ask if it refreshes your recollection.

A No, I did not specifically during that model year that you mentioned.

Q Can you tell me, sir, if the Ford Motor Company introduced both a new three-speed fully synchronized shift transmission with overdrive in the 1963 model year and at the same time introduced the Ford equalock differential, a limited slip differential? Do you know if that is a fact?

MS. RAWSON: Objection, unless he specifies the model of car.

Q All Ford models.

A No, I do not.

MR. GRAND: Sometimes I surprise even myself, Judge. I'm done.

THE COURT: All right. Do you have any redirect?

MS. RAWSON: No, your Honor.

THE COURT: Step down.

[Witness excused.]

MR. BENBOW: Our next witness, your Honor, is Professor Rabins, and Mr. Lagemann will conduct the questioning.

M I C H A E L J E R O M E R A B I N S, called as a witness by the defendant, having been first duly sworn, testified as follows:

DIRECT EXAMINATION

BY MR. LAGEMANN:

Q Professor Rabins, would you state your address for the record?

A 504 Tilden Avenue, Teaneck, New Jersey.

Q And what is your profession, Professor Rabins?

A I am a Professor of System Engineering and a Mechanical Engineer.

Q Do you have any specialties within the mechanical engineering field?

A Yes. My specialization is in the analysis and design of automatic control devices applied to mechanical engineering systems.

Q And by whom, sir, are you currently employed?

A I am a Professor of System Engineering at the Polytechnic Institute of New York and I am the Director of the System Engineering Program at the Polytechnic

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Q During the regular academic year do you teach any courses involving or on computer simulations?

A First of all, the courses I mentioned before, the automatic control courses, to one degree or another all have some computer concept. As a matter of fact, the book that I use, my book, has a chapter on digital and analog computer simulation of control systems. That's part and parcel of the control courses that I teach.

In addition, there is a graduate level course that I teach on the use of computers in ~~similating~~ simulating social systems and this uses particular language, dynamo language, that has been developed by Forrester up at MIT, Professor J. Forrester. It has been much talked about recently.

MR. DE RENSIS: Your Honor, can we find out what a social system is?

THE COURT: Sure. Go ahead, tell us what a social system is.

THE WITNESS: Well, that's the application -- what I was getting at in my answer was the application of computers and modeling techniques to non-engineering systems. Usually engineers are worried about hardware, the way men or people use hardware or how they

Q Can you tell us how much you have been paid?

A To date I have been paid -- the total I have been paid? $1,437.50.

Q How much is remaining in unbilled charges?

A I haven't tallied it up. I can give you an estimate.

Q Give me an estimate.

A $1,500.

Q Have you rendered any bills which have not been paid yet?

A Yes, there is one bill for $1,037.50.

Q Is your expertise on the subject of the Perma system based in any part on discussions with Mr. MacDuff, who is sitting behind Mr. Lagemann?

A I don't understand your question. Can you rephrase it in a way that I can be more direct in an answer?

Q All right. Is your knowledge of the Perma system based in any part on conversations with Mr. MacDuff?

A Of course.

Q Is your knowledge of the Perma system based in any part on conversations with Albert Romel?

A No, I have never met Mr. Romel.

Q When you testified on direct that you met with

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some engineers and Mr. Lagemann, can you tell us who those engineers were?

A It was Mr. MacDuff and one engineer from the Singer Company.

Q Do you know the name of that engineer?

A Mr. George Hare.

Q Yesterday you gave the following answer to the question I am about to read to you. This is at Page 7858:

"Question: During the regular academic year do you teach any courses involving or on computer simulations?

"Answer: First of all, the courses I mentioned before, the automatic control courses, to one degree or another, all have some computer concept. As a matter of fact, the book I use, my book, has a chapter on digital and analog computer simulation of control systems. That's part and parcel of the control courses that I teach."

The answer goes on.

I want to ask you, sir, when you refer to "my book", what book are you referring to?

A Okay. It is not the book that Mr. DeVilliers is familiar with. It's a more recent book that McGraw-Hill just published called Introducing Systems and Control.

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It's Chapter 4 that I was referring to.

Q Were you the only author of that book?

A No. It was co-authored with Yasundo Takahashi and David Anderson.

Q That book that you just mentioned, was that an undergraduate text?

A I hope it still is.

Q What is it intended to be an undergraduate text?

A Yes.

Q On Page 7855:

"Question: Professor Rabins, have you published any books or papers in the field of automatic controls?

"Answer: I have a graduate level text which was published four years ago."

Can you tell me what graduate level text you have?

A I am sorry.

Q What graduate level text do you have?

THE COURT: Wait a second. What is the name of the text book for the graduate course?

THE WITNESS: Control, co-authored with the same people mentioned before.

Q When you say, "I have an undergraduate text

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which was just published by McGraw-Hill," you are again referring to the 1974 book co-authored by Takahashi and Auslander?

MR. LAGEMANN: Your Honor, I object. How many times have we been through it? It's in the direct, it's in the resume, he said it on direct, he had already said it once on cross, and here we are asking the same question again.

THE COURT: No, it looks like we are not. I will permit it.

Is that the one?

THE WITNESS: Yes.

Q So that none of these books did you publish by yourself, is that correct?

A That is correct.

Q Incidentally, when was the graduate level text published?

MR. LAGEMANN: I object, your Honor.

THE COURT: He just said four years ago. Is that correct?

Q Is that about 1970?

THE COURT: Is that correct, four years ago?

THE WITNESS: That's correct.

MR. LAGEMANN: Your Honor, I object again. There

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A I am sorry. The intent was "for."

Q Did you have the actual distillation column at Polytechnic or did you have a model of the distillation --

A An actual distillation column.

Q What is the size of a distillation column?

A This one happens to be about 20 feet high.

Q Did you use the oscillograph tapes contained in Defendant's 15-A and Defendant's 577 to validate the simulation of the Perma device?

A No. It's an impossibility for me to do that. This will become clear, I think, as my testimony goes forward.

Q Did you use the hardware in any way to compare against the simulation of Mr. DeVilliers?

MR. LAGEMANN: I object to the form, your Honor. I think this question can be rephrased to make more sense.

THE COURT: Do you understand thequestion?

THE WITNESS: I didn't hear one word of it. Thats my problem.

THE COURT: All right. Read it back.

(Question read.)

MR. LAGEMANN: I still object, your Honor.

THE COURT: Did you?

A Sure. I looked at it and came to -- I looked

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at the device, analyzed it in my mind and scratch work on paper, and I compared it against the computer simulation. If that's what you are getting at, sure.

Q Did any other persons with whom you discussed this case at Winthrop-Stimson or Mr. McDuff or Mr. Hare tell you that there was a possibility the hardware was not manufactured properly?

A No.

Q Did you make any investigation todetermine whether the hardware was made to specification?

A No.

MR. LAGEMANN: I object, your Honor.

A I didn't know what the specifications were. I believe I testified earlier I never saw the specification.

THE COURT: Yes.

MR. DE RENSIS: Your Honor, I have no further questions. I do want to state an objection.

THE COURT: Sure, go ahead.

MR. DE RENSIS: Your Honor, I object to the recognition of Mr. Rabins as an expert here on Mr. DeVilliers' computer simulations for the following reasons:

1. He hasn't reviewed the drawings of this device.

2. He has not performed any simulations alone

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within the last five years.

3. He has performed only two simulations. One was an analogue simulation 12 years ago, and a second one, which was an academician's dream of three years in the making.

I can understand why the industry is not for him when it took three years to develop that simulation. He is not pragmatically oriented toward industry. There has been no mention of the art of industry here.

He has also demonstrated an imprecision in his answers and on his resume that demonstrates the absence of the precise mind that is required to do the kind of mathematical work or the kind of detail work that this man is being offered for.

Therefore, we object.

THE COURT: Overruled. Go ahead.

BY MR. LAGEMANN:

Q Professor Rabins, do you recall testifying on voir dire that you were retained I believe it was April 19th of this year?

A That's correct.

Q What were you retained to do at that time, sir?

A Our discussions at that time centered on the possibility of performing a simulation of the DeVilliers

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device.

Q Did there come a time when you were told not to pursue any further work in that direction?

A Yes. On May 1st I was told to hold everything.

Q Did there come a time when you were contacted again by representatives of the Singer Corporation?

A Yes. On June 3rd I received a telephone call from you asking me to start an analysis of Mr. DeVilliers' sinulation and modeling and to come back to you when I had some thoughts gathered on it, and I did that on June 12th, I believe I came back to you, with a preliminary report.

Q Did you later come back with another report, and if so, when was that?

A On June 16th I came back with some additional computations, scratch work, thoughts. On June 17th, at that point I was told that I would be a witness in this case and was asked to start preparing material for presentation.

Q Professor Rabins, are computer simulations used in the development of new devices?

A Certainly.

Q How are computer simulations used in the development of commercial products?

MR. DE RENSIS: Your Honor, we are way beyond

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what this man is here for. He is here to talk about --

MR. LAGEMANN: These are preliminaries, your Honor. It's going to become very clear in about two questions.

THE COURT: All right. I will permit it. Go ahead.

A Would you repeat that question, please.

THE COURT: How are computer simulations used in developing new devices.

Q Commercial devices.

A There are a couple of important ways.

Firstof all, when a device is being developed a computer simulation is often used to test the device under controlled conditions, have the device undergo various inputs, various forcing functions, various constraints. The performance and behavior of the device then is evaluated from the computer simulation once a valid simulation is available to run these tests on.

Another way in which a computer simulation is used to develop a commercial device is an optimization procedure, where one might wish to come up with the best design of a device and try all different combinations of constants and sizes and densities and what have you.

Q Can a computer simulation demonstrate that

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idea or a a concept for a commercial device is valid?

MR. DE RENSIS: Your Honor, I object now. This is not background questioning. This is going beyond what this man was offered for.

THE COURT: He was offered basically to attack Mr. DeVilliers' device. His answer is going to be, I assume, no, that it cannot, and basically what he is going to say is that no computer simulation in this situation has any validity whatsoever.

Is that a good summary of your testimony?

THE WITNESS: Well, that's a good answer for me. I would only add one small point, that before a computer simulation could be used to demonstrate the viability of any idea it has to be valid, has to be shown to be true.

Q How do you validate a computer simulation?

MR. DE RENSIS: Your Honor, that previous question your statement and his answer, I think there is a contradiction, because I think he is saying it can be used to validate a device provided that the simulation is valid, which is different from what you said.

THE COURT: I understand.

MR. DE RENSIS: I think that he shouldbe allowed to answer the question that Mr. Lagemann --

THE COURT: The first one? Go ahead.

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Read it back.

(Question read.)

A No, not until the computer simulation has been proved out by a validation procedure.

Q How are computer simulations of commercial devices, devices intended for the market, validated?

MR. DE RENSIS: I object. There is no foundation. Are we talking about all commercial devices, all simulations?

THE COURT: I assume we are. We are going to get a whole raft of things.

MR. DE RENSIS: But there is no foundation for that.

THE COURT: Oh, come on. Go ahead, answer it.

A There is a procedure that is followed --

THE COURT: One?

A -- a generally accepted procedure that is followed, where a computer simulation is developed, it's proposed, and at the same time a prototype or bread board -- that's engineering jargon -- of the device is built and the computer simulation results under the same kinds of conditions that the prototype device is subjected to are compared, and once the computer simulation predicts the same thing that the prototype is actually doing in real world

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performance, then you can rely upon the computer simulation and use it in order to either optimize, as mentioned before, or, as discussed before, to test the device under a whole slew of different conditions.

Q Are there any generally recognized authorities in the engineering field which define validation and which describe the manner in which validation is performed?

A Yes. Virtually any textbook or recognized authority --

MR. DE RENSIS: I object to that unless we get names.

THE WITNESS: All right, I will give them to you.

THE COURT: Go ahead.

THE WITNESS: There are two textbooks in particular that are on the table over there that are well-known authorities. One is a fellow by the name of J. Forrester at MIT. He is an electrical engineer and he has written a book called Industrial Dynamics and he has some very crisp definitions of validation as I have just given them in my lay, imprecise language conversationally.

Forrester, by the way, is one of the prime inventors of the core memory in the digital computer and was the project manager on the distant early warning system, DEWS. He now is a professor at the Sloan School

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of Management at MIT and he has been instrumental in developing new computer simulation techniques and new computer languages.

The other authority I can mention by name is McMillan and Gonzalez. It's a book entitled System Analysis, A Computer Simulation Approach To Decision Models. That s a standard reference in computer simulation courses. They have some good terse descriptions of the validation procedure I have just discussed.

If the Court would like, I could find pages and references.

THE COURT: No.

Q Under generally accepted engineering practices would an unvalidated computer simulation be used as a basis for concluding that a design is viable?

MR. DE RENSIS: I object.

THE COURT: No, I will permit it.

MR. DE RENSIS: This is his opinion, not the generally accepted opinion.

THE COURT: All right. It's his opinion of what is generally accepted.

A My understanding of generally accepted practice --

THE COURT: No. What is your opinion of the generally accepted practice?

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THE WITNESS: That an unvalidated computer simulation would certainly not be used to demonstrate the viability of a commercial design, particularly if human life and limb are at stake. That's a tenant of professional engineering practice and it's a code of professional ethics.

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Q Professor Rabins, in the materials that you have reviewed, which pertain to this case, have you seen any indication that Mr. DeVilliers has validated his simulations?

A No, I have not.

MR. DE RENSIS: Is he referring to testimony?

THE COURT: I assume he is referring to testimony.

THE WITNESS: Yes.

Q Are you also referring to the exhibits which you

said you reviewed?

A Yes.

computer to do what the real world is actually doing. Then you have confidence in your simulation.

THE COURT: Okay. Professor Rabins, you were first contacted on the 19th of April; is that correct?

THE WITNESS: That's correct.

THE COURT: And you were asked at that time whether you could run a computer simulation; is that correct?

THE WITNESS: That's correct.

THE COURT: When did you report back that you could not?

THE WITNESS: Could not?

THE COURT: When did they tell you not to?

THE WITNESS: May 1st. They told me to cease and desist all considerations of building a computer simulation of this device, and I had started work along general lines to do that.

Q While we are on that subject, Professor Rabins, did you provide a time estimate of the amount of the time it would take to perform a computer simulation of the Perma device?

MR. DE RENSIS: I object.

THE COURT: That it would take him?

Q Professor Rabins, could you or, indeed, anyone else duplicate or repeat Mr. DeVilliers' simulations by using the information and data in Mr. DeVilliers' testimony and the exhibits which he prepared?

MR. DE RENSIS: I object to anyone else.

THE COURT: Strike that. Could you do it?

THE WITNESS: It would be virtually impossible. I would have great difficulty in three areas. The mathematical models that MR. DeVilliers has prepared are very sketchy, and it is not clear which equations he has put into his program and how he has used them and how he has put them together, what comes after what, what causes what, what's input, what's output, and a chain of logic going through the device.

My second difficulty is there is no block diagram available of his computer simulation. I don't know the logic that he used in order to simulate this device. This would include the branching points and logic decisions, when you go up, when you go down.

The third thing that is missing which would make it virtually impossible for me to get exactly the same printout as Mr. DeVilliers got would be a computer program listing of what he did. Now, if I had that, that would take care of the other two because then you could work backwards and figure out the block diagram and model that he must have used in order to have arrived at that computer simulation.

So we are missing the block diagram and missing the computer listing and having a very sketchy -- I'm

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sorry to have to say it, but not professionally developed set of equations and models to work with, it would be virtually impossible for me to replicate what Mr. DeVilliers has done.

upon each particular system and each system is an ad hoc case unto itself. It has to be analyzed and it has to be evaluated.

THE COURT: Mr. Lagemann, do you realize what you did? You asked him to answer a general question and he ended up by saying each system has to be analyzed and evaluated individually as an ad hoc situation.

Is that correct?

THE WITNESS: That's right.

THE COURT: Go ahead. Ask your next question.

MR. LAGEMANN: Would you mark this as Defendant's Exhibit 708.

(Defendant's Exhibit D-708 marked for identification.)

Q Mr. Rabins, I show you what has been marked as Defendant's Exhibit 708 for identification and ask if you will identify it, please.

A Yes. This is a Xerox of the 18-to-1 gear ratio printout with a heading "Simulation of Perma Anti-Skid Device" that I studied and made some entries on and directed other entries to be made on in color.

Q What do the entries in color on Defendant's Exhibit 708 for identification denote in general terms?

A Incidentally, I also indexed the pages, numbered

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the pages, and we have a page index on the front.

The blocks of data lined out by the colored lines denote discrepancies between what the printout is saying the anti-skid device and speed controller or the speed governor is doing and what has to be happening according to physical law. So there are some anomolies in here that we have located. These are typical. They are not all. These are some typical examples of differences between what the printout is saying the device should do and what it has to do according to well-understood physical law.

MR. LAGEMANN: I will offer Defendant's Exhibit 708 in evidence, your Honor. Copies or a copy, rather, was provided to plaintiff's counsel this morning.

MR. DE RENSIS: Your Honor, as far as I can tell right now, what we are dealing with is his notes on something. I don't know what they are. They are not self-evident. I don't want to state there is no objection when I don't know what it is. I don't know what the analysis is.

THE COURT: Let me see it.

What does one green stand for?

THE WITNESS: Those aren't ones. Those are little color hash marks, indicating on page 1 a green entry is made.

THE COURT: What does green stand for?

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THE WITNESS: We are going to discuss that.

THE COURT: No, no, not until they know what green stands for. They don't understand what this document means. That is why they can't object or not.

THE WITNESS: I see. On page 1 --

THE COURT: What does green generally stand for?

THE WITNESS: It stands for one kind of anamoly between the printout of the simulation and the behavior of the device as it must behave by physical law.

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THE COURT: What physical law?

THE WITNESS: In this case, I believe it is fundamentally Newton's Second Law of Motion.

THE COURT: All right. What does black stand for?

THE WITNESS: Black is an anomaly involving the behavior of the governor device, involving the collapse and expand speeds of the governor and a discrepancy between what is printed out in here as happening between collapse and expand speeds of the governor and what has to be happening by laws of kinetics.

THE COURT: Which laws of kinetics?

THE WITNESS: Fundamental introductory laws of kinetics.

THE COURT: Okay. What does red stand for?

THE WITNESS: Red is a situation involving the cam gear where it takes a certain amount of time for the pin on the governor shaft to traverse across the cam gear slot and we have gone through some very simple computations and we have compared those computed traverse times with some printout situations here, and deduced discrepancies.

THE COURT: How did you compute them?

MR. LAGEMANN: Your Honor, if you would let

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Q Professor Rabins, I show you Defendant's Exhibit 708 for identification. Could you show us where the yellow markings are and tell us what they denote?

A Certainly. On Page 27, the yellow markings appear in two columns, and on Pages 34 and 35 they appear in one column.

Q For identification purposes, what columns are

these to which you are referring?

THE COURT: Oh, no, they are there. Don't worry about it. Go ahead.

Now tell us what they denote.

THE WITNESS: Okay. In the right-hand columns, when we are talking about the rear wheel, the left-hand columns, when we are talking about the front wheel; we blocked out the acceleration and velocity data of the wheel and we have a continuous block of data from T equals 0.500 down to the bottom of Page 27. That's about two and a half seconds as reported decelerations of the wheel while the wheel speed is building up, increasing three lines, then three lines of acceleration of the wheel, while the wheel speed is slowing down, and two lines of deceleration while the wheel speed is building up, and the two seem to be exactly out of phase.

Now, this doesn't happen everywhere in the record. It happens here. It is an anonaly that we have trouble understanding from the model.

THE COURT: Okay. Does that same thing apply across on the other side, the left-hand side?

THE WITNESS: The left-hand side, front wheel behavior, the yellow block areas, same behavior continuously. Same thing on Pages 34 and 35, and the lengths of time

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for which the acceleration is reported as positive while the velocity is going down and vice versa varied. They are not constant. There is no set period or no set pattern that is discernable.

THE COURT: All right.

Q Is it physically possible, Professor Rabins, for a wheel which is decelerating to be increasing in wheel speed and, conversely, for a wheel which is accelerating to be decreasing in speed during a period of constant acceleration or deceleration?

A Well, first of all, I don't know that this is constant acceleration. All we know is the printout data we have here. We don't know what is happening in between these printout lines.

Second of all, if I look at a very, very simple portion of what is happening here, if you think of just a rotating disc, a tire, and I apply torques on that disc so that there is an acceleration being felt by that disc, you would expect the disc to be speeding up while it is accelerating, and while I put braking torques on the disc to slow it down, to put decelerations on it, while it is decelerating, you would expect it to slow down. That is not happening in those yellow periods.

Q I notice there are periods in green marked in

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Defendant's Exhibit 708 for identification. Would you tell us what the periods in green are?

A The green I have a much more difficult problem. And it is a different problem. To identify this for the record, the first entry is on Page 1. There is a block of front wheel accelerations and velocities from 2.00 to 2.400 for four-tenths of a second.

Then there is a block of green data on Page 13 from .450 to .600.

There is a block of green numbers on Page 15 -- well, there's three of them, from .700 to .850, from 1.150 to 1.600, and from 2.600 to 2.750.

There is a block of data -- now, it is entered on the index page as 21. That's because the run that is indexed starts on Page 21, but the data is on Page 22.

THE COURT: Okay.

THE WITNESS: On Page 22, for the rear wheel, there are three entries made.

THE COURT: That's enough.

THE WITNESS: Okay. On Page 31 there is one entry made for the rear wheel at the bottom of the page.

MR. DE RENSIS: YOur Honor, do we have an indexing of every green line on this paper?

THE WITNESS: You have got it.

MR. DE RENSIS: I have got a copy here without any colors.

MR. LAGEMANN: IN the front you have an index.

THE WITNESS: You have a code on the index cover. The Xerox doesn't take colors.

MR. DE RENSIS: The point is, do we need a v[illegible] description of the document?

THE WITNESS: No, it is coded for you on the cover for you.

THE COURT: What he is saying is, in view of the fact it is coded here, and I have to end up re-reading this and re-reading the record. do we have to have it done again.

THE WITNESS: No.

THE COURT: Okay.

What does the green represent?

THE WITNESS: Let's take the first one as an example.

THE COURT: Let's take the first one.

THE WITNESS: Okay. And the behavior I am going to describe now occurs in all of the blocks of numbers that were outlined in green, and those aren't the only places. Those are typical. Okay? Through that whole block of data the acceleration is constantly

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reported as negative. There is one line in the middle. All right. First four lines it is negative, last four lines it is negative. Okay?

What is happening is, if you look at the velocities corresponding to the lines, the velocities are modulating or oscillating, going up and down.

Look at the second example, just to pin one more down, Page 13; there is four lines of negative reported front wheel accelerations and yet while we get reports of strictly negative accelerations, the rear wheel velocity is modulating, going up and down.

THE COURT: Is that front or rear?

THE WITNESS: That's front.

THE COURT: Okay.

THE WITNESS: It goes from 26.3 feet per second to 16.28, back up to 25.05, and yet it is reported here that the wheel is undergoing acceleration -- deceleration, negative deceleration through that whole block. That's true of all of the green blocks of data.

THE COURT: Okay.

MR. DE RENSIS: When you are talking about strictly negative, you are only talking about what is reported here and not what is between the lines, is that correct?

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THE WITNESS: That's absolutely correct.

MR. LAGEMANN: Your Honor, I object to this cross-examination going on.

THE COURT: I was just about to ask him that.

MR. LAGEMANN: Okay.

MR. DE RENSIS: I didn't understand the answer.

THE WITNESS: That's absolutely correct. You are one step ahead of us.

THE COURT: Okay. Now, what is your problem with this? You started talking about Newton's Second Law. Let's get to that.

THE WITNESS: Okay.

THE COURT: Where's the calculations?

THE WITNESS: There's no calculations on this one, just discussion. We don't need computations.

In order for a body to change direction or change level of its velocities up and down it has got to be subjected to first accelerations, then decelerations, then accelerations, then decelerations. That is the only thing that can make a body modulate its velocity, alternating acceleration behavior.

The conclusion we come to about this is that in between these lines there is a lot more going on than appears in this printout, a heck of a lot more going on

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at a much higher frequency than this printout is telling us, significantly larger.

As a matter of fact, we have a demonstration that shows exactly what we are getting at.

THE COURT: Do you have a chart or something?

THE WITNESS: Yes.

THE COURT: Let's get it.

THE WITNESS: Before I give you the demonstration, let me explain in words what is behind this, and it comes under the general heading of information, theory and how often you have to sample or measure something to know what is going on.

In particular, there is a guy out of Bell Telephone Laboratories by the name of Shannon who has a theory called Shannon's Theory or Shannon's Therum which essentially says that you have to --

MR. DE RENSIS: I object.

THE COURT: Go ahead.

THE WITNESS: You have to essentially sample something at least five times for each cycle that it is occurring to be able to reconstruct what is happening.

Now, let's say something is cycling up and down, and let's say we don't measure it, we don't know anything about it; it's happening on the other side of

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that wall and we want to find out what is happening on the other side of that wall, and what we do is we measure it, not five times, not measuring it five times each cycle that it is bouncing up and down, but we happen to measure once each cycle, take a measurement, cycle it, we take a measurement, and if we try to reconstruct what is happening behind that wall from that data, we will be completely misled. What we will find out is that we have a straight line behavior.

THE COURT: Instead of a wave.

THE WITNESS: That's right. We have a demonstration to show something about the printout there that relates to those green blocks.

THE COURT: This is Exhibit what?

MR. LAGEMANN: I am placing Defendant's Exhibit 680 and a piece of onion skin paper before Professor Rabins who is about to proceed with his demonstration.

THE WITNESS: First of all, to locate this, I will put little marks on the onion skin at .5, 1.0 and 1.5, and I will label them, .5 -- 1.00 and 500 and 1.500. Again I am going to trace out the points and these points were taken from the computer printout, and since we didn't know what was happening between computer printout lines, the points were disconnected. We are

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THE COURT: Any one of the three I used. You can do the same.

A You can call me Mike if you want.

Q Do you recall telling us about a guy out at Bell Telephone Laboratories by the name of Shannon?

A That's correct.

Q Isn't that Shannon one of the founders of the Information Theory?

A That's my understanding. This is not my area, but my understanding is he is one of the founders of the field .

Q And he has, in fact, written a number of books and papers?

A That's correct.

Q In fact, he is an eminent man, is he not?

A Oh, yes, very much so.

Q At Page 7991 of the transcript you say, starting at Line 14:

"In particular, there is a guy out at Bell Telephone Laboratories by the name of Shannon who has a theory called Shannon's Theory or Shannon's Therum which essentially says that you have to -- you have to essentially sample something at least five times for each cycle that it is occurring to be able to reconstruct

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what is happening."

Do you recall that testimony?

A Yes, I recall the statement. You left out a word. He is not out at Bell Laboratories. He is out of Bell Laboratories.

THE COURT: That's what you said, he is "out of Bell Telephone Laboratories."

THE WITNESS: That's right.

Q Otherwise what I read is correct?

A Yes, yes.

Q Now, I assume you recognize the Takahashi - Rabins - Auslander book as an authority ?

A Yes.

THE COURT: Get a free plug in for your book.

THE WITNESS: Thank you.

Q I'd like to show you Pages 471 and 472 of your book and ask you whether your description of the Shannon Theory in terms of five samples per cycle is wrong.

A Wrong in what context, please?

Q The paragraph starts on Page 471, and I direct your attention in particular to the sampling period. "The sampling period 'T' must be shorter than a half period of the highest frequency signal component."

A I still have trouble with your question. Wrong

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in what context, Mr. DeRensis?

Q The five samples per cycle is wrong, is it not?

A Would you please permit me to read this, what is written here, then I will answer your question.

Q Sure. Be my guest.

A No, Mr. De Rensis, it is not wrong. You are taking something out of context in this book, and you are trying to compare it with something out of context in my testimony. The concept of 5, if I remember correctly, I said "about 5", and I think I waved my hand when I said it -- it is common practice in reconstructing. I was not, if I remember correctly citing a precise therum. I was citing a practice of application for pragmatic results.

Q But Shannon's Theory requires only two samples, does it not, per cycle?

A All right. "In practice therefore" -- I am reading from the book now -- "the sample period 'T' must be shorter than" -- shorter than -- "a half period of the highest frequency signal component."

That is the upper limit.

What I was citing when I said 5, it was common practice to account for such things as noise in signals, mis-computation, round-off errors, a whole slew of

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other things that could enter into your measurements.

Q When you said that there is a guy out of Bell Telephone Laboratories by the name of Shannon who has a theory which essentially says that you have to sample something at least five times for each cycle that it is occurring to be able to reconstruct what was happening, you weren't talking about Shannon'sTherum; you were talking about the practice.

A I was -- go ahead.

Q Were you talking about Shannon's Theory or were you talking about a practice?

A Shannon's Therum -- you are correct -- says every half cycle at the limit. My statement was essentially -- my intent in that testimony was to indicate practice. That is why I used the word "essentially."

Q Does Shannon's Theory essentially say that you have to sample at least 5 times?

THE COURT: He just said it says that it has to be sampled twice per cycle.

MR. DE RENSIS: I thought he just told me that Shannon's Theory essentially did allow for 5.

A It does allow for 5, Mr. DeRensis. "Shorter than" -- it is an any quality, not an equality.

Q Does it require 5?

A It requires 2, in the limit, in theory.

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Q Dr. Rabins, at 7921 of the transcript appears the following question:

"Question: Under generally accepted engineering practices would be unvalidated computer simulation be used as a basis for concluding that a design is viable"?

The answer appears on the first of the pages number 7922. It starts on 7921.

"Answer: My understanding of generally accepted practice that an unvalidated computer simulation would certainly not be used to demonstrate the viability of a commercial design, particularly if human life and limb are at stake. That's a tenant of professional engineering practice and it's a code of professional ethics."

Did you have the DeVilliers' simulations in mind when you gave that answer?

A No.

MR. LAGEMANN: Objection.

THE COURT: He answered it already. He said no.

Q Did you have any reason to believe that the DeVilliers' simulations were to be used as a substitute for testing in a product development program?

MR. LAGEMANN: I am sorry. I couldn't hear it.

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I am trying, but I could not.

(Question read.)

MR. LAGEMANN: YOur Honor, I object to the question, particularly the form. There seem to be several aspects there or different questions contained in it.

THE COURT: No. It's one fairly simple question. I will permit it.

Go ahead. Can you answer it?

A I am not sure if I can answer that precisely, Mr. DeRensis, because in my discussions with my counsel the DeVilliers' testimony and simulation was being presented as having been presented to the Court in lieu of product development or actual testing. So I don't know how to answer that, because my interpretation of my discussions with my lawyer would be yes, I was being led to believe in the direction you are implying.

Q Can you tell us who it was who told you that?

A I don't think I can specify. It's just general conclusions.

MR. LAGEMANN: YOur Honor, I object.

THE COURT: I don't think it's necessary. He indicated his counsel. Which one of them doesn't matter.

Q Sir, I would like to show you Plaintiff's

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Exhibit 132, which is entitled, "Vehicle Equations of Motion", and in particular the equation that appears on Page 2 in the middle of the page. Can you tell me if that's a linear equation or a non-linear?

A Which equation are you referring to?

THE COURT: The ones immediately under the words, "general LaGrange equations of motion are."

A If you are referring to just those first two, the answer is no, I cannot yet tell until I am told what the functions "T" and "V" and "D" and "Q" are. It may be linear, it may be non-linear, depending upon what functions you put in.

Q Look at the entire document.

A If you go to the next four equations, those are linear differential equations, again, depending upon what is put in for the forcing functions over on the right. These terms --

Q Would you look at the third one on the line?

A Equation 3?

Q Equation No. 3.

A I have to reconstruct what "FB1" and "FB2" and "HCG" are. 2 is this variable, "B" is the friction force. The third equation is non-linear because it includes friction.

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"HCG", I don't know if he defines it in here.

Putting aside the term "HCG", which I don't seem to be able to locate on these two pages --

Q Let me show you 133-A, which has a list --

A Okay. Center of gravity, location above ground. That's a dimension.

The answer to your question would be the third equation is non-linear of those -- of equations 1, 2 and 3, the third one is definitely non-linear because of the friction term in there.

I should clarify something for the record, your Honor. That is not the same as the discussion of my friction yesterday when I was discussing the omission of friction and the non-linearity effects upon the system.

MR. DE RENSIS: Your Honor, I object to that. It's not responsive.

THE COURT: In other words, there is friction in these equations?

THE WITNESS: There is friction in these equations, but that is not the omission I was talking about yesterday. The omission of friction causing non-linear effects in the device --

MR. DE RENSIS: Your Honor, I object to this.

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THE COURT: You will get a chance with your counsel. The question is is this a linear equation and the answer is no, is that correct?

THE WITNESS: Equation 3 is non-linear, that's correct.

Q What about equations 4 and 5?

A Equations 4 and 5 are also non-linear, Mr. DeRensis.

Q I show you Plaintiff's Exhibit 134, Page 2, the equation that is circled in pencil and has written next to it, "entered". Is that equation non-linear, sir ?

A I will try again, your Honor. It's not non-linear in the sense I was discussing yesterday.

THE COURT: Okay. It is not non-linear.

THE WITNESS: In the sense I was discussing yesterday.

THE COURT: Okay.

Q Is that a non-linear equation, sir?

A In answer to your specific question, yes, it is a non-linear equation.

Q Thank you, sir.

MR. DE RENSIS: Your Honor, I think this witness should be instructed to answer the questions

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asked rather than answer the questions he would like to.

MR. LAGEMANN: I object to that. The witness most certainly has not.

MR. GRAND: I agree.

MR. DE RENSIS: He is advocating.

THE COURT: We have had a lot of that around here. Go ahead.

Q I would like to show you Plaintiff's Exhibit 143, particularly the third page of Exhibit 143, the two equations at the top of the page. Are those equations non-linear, sir? And I don't mean in any special definition you have. I mean mathematically are those equations non-linear.

A I didn't recognize this at first because I saw it in Xerox form. That's why I was looking at it.

Yes. This is the non-linear description of the tire/road interface in the simulation.

Q Sir, at Page 7971 of the transcript the following question and answer appear:

"Question: After performing such a study, is it common practice to introduce mathematically the non-linear effects of a mechanical device into a mathematical model of such a device?

"Answer: It is common practice that the

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mathematical models must include the modeling of the non-linear effects investigated on the actual prototype of the device that have been observed or else the simulation is not representing reality of the device, it can't be validated."

By that answer, sir, do you mean that all non-linear effects observed have to be included in the mathematical modeling?

MR. LAGEMANN: Your Honor, I suggest that we get more of a definition of the word "observed" from Mr. DeRensis. I object.

MR. DE RENSIS: I thought it was his word.

THE COURT: No, I will permit the question.

A When you are developing or testing hardware -- I presume you are talking about hardware --

Q No. I am talking about a mathematical simulation. Does it have to include each and every non-linear effect that you observed in the hardware?

THE WITNESS: Can I have all of Mr. DeRensis' statement read back to me, please.

(Question read.)

A Again I say the previous question was the study of actual devices in the transcript and we are talking about a mechanical device and the study of

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hardware.

Now, with that preface, when we study something we look at it, we examine its behavior, we try to come to the best possible mathematical model that we can that describes the performance of that -- the behavior of that device. Now, if there are non-linearities in that device that fundamentally affect the behavior of the device, the non-linearities must be taken into account in the mathematical model.

Q And the non-linearities which do not affect the fundamental performance don't have to be included?

A That's absolutely correct.

Q Did you test the Perma device in any way to determine the magnitude by measurement of non-linearities?

A Depends what you mean by test. Did I hold the device in my hand and look at it and turn the gears? Yes. Did I feel the levels of friction? Yes. Did I observe the cam gear slot, the amount of backlash between gears, the amount of play between one end of the cable and the other, in that sense I tested it.

Q Did you run any tests that resulted in measurements of the magnitude of those forces?

A At one point we were about to start a simulation and test of the device but on May 1st I was

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question is the same answer I gave to you previously, just about three questions ago.

Q Sir, I would like to show you 709, Defendant's 709 in evidence.

THE COURT: Here it is.

Q Would you look at the example on the second page, the first example on the second page.

A Sure.

Q At the speed of 11.29 feet per second --

THE COURT: This being the second line of the first example on the second page. Go ahead.

Q -- the governor weights are expanded or collapsed.

A They are not fully expanded. Almost fully expanded.

Q And at the lower speed of 4.96 feet per second is the governor fully collapsed?

A If the governor is going at that speed, yes, it's collapses.

Q And in the example that you have chosen the governor is fully collapsed at that speed?

A That would be the conclusion, interpretation of the printout record.

Q Do you know where that is in Defendant's 708?

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A Yes, I will find that for you. That's black coded, Page 22.

It's the second and third column from th right between "T" equals 4.450 and 4.500.

Q Is your judgment that the governor weights are collapsed at 4.96?

A Well, let's back up a second.

This printout says that for all of these runs at the 18 to 1 gear ratio, when the governor feels a rear wheel speed of 7.87 miles per hour and above, it is expanded and when it feels a wheel speed of 5.33 and below it is collapsed. Now, that's in miles per hour.

Now, if you convert those to feet per second, as we have done on the first page, the equivalent expand and collapse speeds are 11.54 feet per second and 7.81 feet per second.

Now, 4.96 feet per second is below 7.81, so my interpretation is that the governors, if they were geared directly to the rear wheel, would have collapsed at that speed.

Q And because it's gone from expansion to collapse, the pin has had to traverse that slot, has it not?

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A Well --

Q Isn't that the assumption you were making?

A We don't know that for sure.

Q But that is the assumption you make in Defendant's 709, is it not, while the governor is collapsing and the pin is traversing the slot ?

A And the pin is traversing. That's present tense. We don't know if it's completed its traverse or not. We don't have enough information.

Q But because it has gone from collapse to expansion it', your judgment there is some traversal in there, is that correct?

A Something must have been happening between the pin and the cam gear. Precisely what we can't say.

Q Let me direct your attention to the 12th column and in particular the number 72.6, sir, and ask you, hasn't the pressure switch disengaged between those two numbers, and therefore the governor weights are fully extended?

A I have a copy in my briefcase. I don't remember what that column is. Is that the brake pressu' ?

Q That's the brake pressure.

A All right.

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Q Perhaps to refresh your recollection I will show you the first page of the exhibit, where there is pressure switch settings in foot pounds, and then in psi. In foot pounds it's 150 and psi it's approximately 115.

Then I refer you again to the figure 72.6 and ask you, hasn't the pressure switch opened between those two numbers.

A Mr. DeRensis, you are going to have to bear with me here a second. In all honesty, I did not spend much time looking at the pressure switch and its effects upon the system in the context of what we were calculating and I will have to think it through a moment.

This is the pressure switch that cuts out the system, isn't it, you are referring to?

Q Are you aware there is a pressure switch in the system?

A Yes. This is --

MR. LAGEMANN: YOur Honor, may I suggest he be given Plaintiff's Exhibit 5-A.

THE COURT: If he needs it. Do you want it?

THE WITNESS: Yes. Can I look at 5-A a second? That is the schematic?

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THE COURT: It's not a schematic. It's a drawing. Okay?

THE WITNESS: All right.

(Pause.)

A Okay, I am ready to answer your question now.

MR. DE RENSIS: Would you read the question back so he has it in his mind.

THE WITNESS: I don't need it.

THE COURT: Go ahead.

A The fourth line on -- at "T" equals 4.450, where the pressure is 72.6, at that point the pressure switch would have dropped out according to the numbers given on this simulation.

Q It would have dropped out before that, wouldn't it, in the lines between?

A Somewhere by that number. The solenoid would have overridden and it is entirely true that the governor would be expanding. However, by the time you got down to the next line, 350, the pressure switch would have been reactivated.

Also, if you count up five lines from that box, where it says 11.21 feet per second, down to 5.33, we could have just as easily used that as an example and during that whole period the pressure switch would

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be in entirely.

Q So you want to withdraw that example and pick another one?

A No.

MR. LAGEMANN: I object.

Q Is that what you are doing, sir?

THE COURT: He is saying that there is another one on the same page.

A They are all over the place, Mr. DeRensis.

Q They may be all over the place, but the one you picked, sir, was wrong, wasn't it?

MR. LAGEMANN: I object.

THE COURT: No, I will permit it.

A The one --

Q Yes or no.

A I don't think that can get a direct yes or no.

Q I think it can.

A The calculation itself is correct. There was an oversight on the pressure, it should have been shifted up five lines.

THE COURT: It does not necessarily show what you said it showed yesterday, is that right?

THE WITNESS: At that location in the printout. The calculation is not incorrect of itself.

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THE WITNESS: Oh, yes, sure.

THE COURT: And you played with it.

THE WITNESS: Sure.

THE COURT: Okay. Now, did you figure out, in moving the cam gear, that the pin would have to go at least two and a half teeth to shut the microswitch?

THE WITNESS: Yes, we saw that, sure.

THE COURT: YOu saw that?

THE WITNESS: Yes.

THE COURT: Okay.

Q Sir, let me give you two assumptions. The first assumption is that the force exerted by a spring changes, increases as the spring is compressed, and the second assumption is that at two and a half teeth on the cam gear that microswitch is exerting a force roughly equivalent to a deceleration of 0.92 g's, and I ask you, sir, if at two and a half teeth the applicable figure is 0.92, what would be the figure at the bottom of the slot; it would be less, would it not?

A Perhaps we can save some time --

Q Would you answer my question? Would the force be less than 0.92 at the bottom of the slot?

A Yes.

Q And in your equations in Defendant's Exhibit

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709, you assumed that constant deceleration,did you not , of 0.92 g's throughout the movement of the pin through the cam gear slot?

A That is correct.

Q Sir, this exhibit contains another assumption, does it not, that is, that two conditions must be met, that the governor is collapsing and that the pin is traversing the cam gear slot; is that correct?

A That's correct.

Q If either one of those assumptions is missing, your equations do not hold?

A That is correct.

Q I would like you to assume some facts for a minute, sir. Assume that the velocity of the governor at the expanded speed is 11.54, and the velocity of the governor at collapse is 7.81, and assume --

THE COURT: Wait a second.

THE WITNESS: That is no assumption. That is given.

MR. DE RENSIS: Those are the numbers in 709, your Honor.

THE COURT: Okay.

MR. DE RENSIS: It can be found on the first page.

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THE COURT: Okay.

Q And assume that there is a deceleration occurring at the moment that the governor is spinning at 20 feet per second -- 20; in other words, 9 above its expanded speed. If deceleration was applied at 20, would not the pin have traversed the slot long before we got to the speed of 11.54?

MR. LAGEMANN: Your Honor, there are so many assumptions here, I would like to have the question read back.

THE COURT: Sure, read the question back.

(Question read.)

A It depends upon the acceleration levels.

THE COURT: Deceleration.

Q Let's assume a deceleration level of 0.92, a constant deceleration as you assumed in --

A The answer is no. Your expert is waving at you. He is trying to get your attention. The answer is no, you are wrong, Mr. DeRensis. Tell him.

MR. DE RENSIS: Your Honor, I object to that.

THE COURT: Yes, that is a little bit flip. Come on.

Q Let me give you the same conditions, except deceleration is larger than .92 g's.

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MR. LAGEMANN: How much larger, your Honor? I object again.

THE COURT: All right, 1 g.

THE WITNESS: May I have Exhibit D-710, please?

THE COURT: Will this take you a couple of minutes?

THE WITNESS: No.

THE COURT: Okay.

A Mr. DeRensis, you want a deceleration of 1 g, right?

Q Yes.

A And you are saying that this is one printout line above where the 11.54 is, is that the idea? I am trying to get the problem figured out.

Q Not necessarily one printout line. However long it takes to go from 20 to 11. Perhaps, sir, to make your life easy instead of asking you whether it would --

A That's okay. That's okay.

THE COURT: Let him do it.

A I've got a little bit of a problem. This is a borrowed computer. I left mine at home this morning.

THE COURT: Don't worry about it.

THE WITNESS: So I've got to find the right pins.

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(Pause.)

THE COURT: I'll tell you what, we will take a ten-minute break.

THE WITNESS: I don't need it.

MR. DE RENSIS: Your Honor, I can reframe the question.

THE WITNESS: I can get it real quick. Give me a pen. It's much quicker. You try to figure out someone else's computer, your Honor --

MR. DE RENSIS: I can reframe the question.

THE COURT: Let him do it.

(Pause.)

A At that acceleration level it will take about 40 seconds.

THE COURT: Acceleration or deceleration?

THE WITNESS: At that deceleration level.

Q It would take 40 seconds?

A No, wait a second. Maybe we had better take a recess.

THE COURT: Okay, we will take ten.

(Recess.)

THE COURT: Okay. We had a pending problem. Do you have it resolved?

THE WITNESS: Yes. Can I have read back my

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last entry just before the recess?

THE COURT: Yes.

(Record read.)

THE WITNESS: I was computing not the time but the acceleration, the relative acceleration between the cam gear and the governor shaft. I was looking at the equation at the top of Page 2 of Defendant's Exhibit 710. Again, I was one step ahead of myself. I should have been calculating the time. We had already done that and for the minus 1 g of deceleration we have already computed that that would take .290 milliseconds to traverse the slot.

MR. DE RENSIS: May I proceed?

THE COURT: Sure.

BY MR. DE RENSIS:

Q Sir, if we assume the opening and closing speeds referred to in 709 and we assume that the governor is going above the expanded speed of the governor, isn't it a fact, sir, that the pin will start to move before the governor starts to collapse?

MR. LAGEMANN: Can I have that read back? I apologize, your Honor.

THE COURT: Sure, go ahead.

(Question read.)

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THE COURT: Okay.

MR. DE RENSIS: No further questions.

(Witness excused.)

THE COURT: All right , gentlemen --

MR. GRAND: Can we say we all formally rest?

THE COURT: You are going to formally rest one way or another, everybody.

Okay, you can have the month of July and the month of August to prepare proposed findings of fact and conclusions of law along with the briefs. That's two complete months. I want them delivered to chambers along with the original of all of the exhibits in evidence, and I also want delivered to chambers the two exhibits, 696 and 696-ZZ. That you can do today. All right?

MR. GRAND: There is no 696-ZZ, Judge.

THE COURT: Well, "Z", then.

MR. GRAND: That's the one that was destroyed.

THE COURT: Okay.

MR. BENBOW: Your Honor, could I raise a point or two?

THE COURT: Sure.

MR. BENBOW: When you struck the testimony of our marketing witness with respect to the marketing

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September 1.

THE COURT: Two weeks is cruel and unusual punishment. It must be unconstitutional.

No, you can have until --

MR. GRAND: September 30th?

THE COURT: All right. I'll tell you what -- the comment was made sotto voce that this is almost the first time that both sides have agreed on anything, to adjourn to September 30th -- I will give you that, but there is absolutely no extension, no extension whatsoever. Anybody who asks for an extension, I am not going to hold them in contempt, I'm just going to ignore whatever they submit.

MR. GRAND: I have another suggestion. If you also make it perfectly clear that there is to be no reply, you make life easier on everybody, including yourself.

THE COURT: I don't care. September 30th is the end. Nothing more. Anybody who comes in with anything after September 30th, I am going to ignore. All right?

MR. GRAND: Thank you, Judge.

THE COURT: Have a delightful summer.

MR. GRAND: You, too, Judge.

MR. BENBOW: Same to you, Judge.